ANNUAL PRODUCT
Preview
ISSUE
1963
UNIQUE KIT-BUILDERS' INSURANCE POLICY!

Only Scott Kits come equipped with one. It's a full-color instruction book to insure you against confusion, incorrect wiring and the installation of wrong parts.

Every part and every wire is reproduced in its exact color. A special printing process is used requiring seventeen different colors...including even silver and gold...to insure life-like reproduction. It is practically impossible to make a construction mistake!

To speed assembly time Scott Kits are divided into convenient assembly groups. There is a separate page in the instruction book for each group, and the parts for that page are mounted, in order, on Scott's unique Part-Charts.

No one but Scott goes to the trouble and expense to give you this kind of kit building insurance. Scott Kits offer many other advantages, too. All wires are cut and stripped to exact length. Tediumous mounting of tube sockets, terminal strips and other mechanical parts is completed at the factory. Critical circuitry such as the FM "front end" is wired by factory experts. When you finish a Scott Kit it will look and work like a factory wired component.

If you've never seen the Scott full-color instruction book visit your dealer now or fill in the coupon below. We'll send you a sample page and a catalog showing all Scott Kits.

H. H. Scott Inc.
111 Powdermill Road
Maynard, Mass.

Rush me a sample page from a Scott full-color kit instruction book. Also enclose a catalog of Scott kits and factory wired components.

Name ____________________________
Address ____________________________
City ____________________________ Zone __________ State __________

Resolve names and addresses of interested friends and we'll send them a duplicate materials.

Assembly Group BF-3

- B33. Add a 13.75" piece of braid wire to one end of a 0.02 ohm (2 ohms). Connect the other end to pin 5. L33. 913.
- B33. Connect the T6, wire from 016, to pin 23. 913.
- B33. Add a 5 Ohm resistor to one end of a 0.125" wire from 016. Connect the other end to pin 2. 913.
- B33. Connect a 100 wire from 016, to pin 5. L33. 913.
- BF30. Connect the banana wire at one end of a 0.125" wire and cut the other end to pin 6. 913.

* A wire passing through a porcelain insulator, insert strip pins before wiring, as shown.

Assembly Group BF-4

- BF43. Connect a 0.127" wire from 016, to pin 2. 913.
- BF45. Connect a 0.025" wire from 016, to pin 2. 913.
- BF47. Connect a 5 Ohm resistor from 016, to pin 5. L33. 913.
- BF10. Clip out the banana wire at one end of a 0.125" wire and cut the other end to pin 7. 913.
- BF11. Connect the banana wire at one end of a 0.125" wire and cut the other end to pin 8. 913.

* A wire passing through a porcelain insulator, insert strip pins before wiring, as shown.

Scott makes seven superb kits...all with full-color instruction books: LK-68 40-Watt Stereo Amplifier Kit, LK-22 30-Watt Stereo Amplifier Kit, LK-72 80-Watt Stereo Amplifier Kit, LT-111 FM Stereo Tuner Kit, LT-211 FM Stereo Tuner Kit, LC-21 Stereo Pre-amplifier Kit, and the LK-150 150-Watt Stereo Hi-Fi Amplifier Kit.

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In the September Issue

On the newstands or in your own mailbox

1. Fisher SA-1000 150-watt stereo power amplifier. We will compare the factory-wired unit with the kit (if it is available in time).
3. Tannoy 10" Dual Concentric Monitor.

Construction

- Mobile FM-stereo reception. North C. Ham. A thorough analysis of the problems of receiving FM-stereo on the move plus a thorough description of how to modify an existing car FM tuner with the addition of a multiplex adapter. Stereo speaker-placement problems in an automobile are also discussed.

Information

- Vertical Tracking Distortion in Practice. Duane H. Cooper. The widespread use of conservative recording levels accounts for the little distortion actually heard, because of vertical tracking error, in many stereo discs. The author uses numbers to describe the levels he is talking about, and gives examples of discs which exhibit the problem.

And Equipment profiles

1. Fisher SA-1000 150-watt stereo power amplifier. We will compare the factory-wired unit with the kit (if it is available in time).
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In the September Issue

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Playing of Acetate Discs

Q. I have quite a few old paper and acetate home-recording discs which are just about worn out. They all have a sentimental value to me, and I want to get them onto tape as soon as possible. I know all about how to dub, and so forth.

However, I've never dubbed from home recordings before and these have varying degrees of surface noise—anything from almost as good as they were originally to practically worn out.

I have heard of filters that can take out all or at least a lot of this extraneous noise. I seem to remember a buddy of mine having a little gismo which was connected between the pickup and preamplifier and which had several settings, old '78s, new '78s, and so on. Are these still available?

If so, what shall I ask for? If they are available, is it the best thing for me to use for the purpose? Maybe you can suggest something better.

Also, one other thing. Some of these records specify cactus needles. Will I be able to record right into my tape recorder directly from the cactus needle and arm or will I have to record from the output of my regular amplifier?

I just happened to think—maybe there is a special kind or size of needle that will cut some noise, too. Any suggestions on that? Ward G. Erwin, La Crescenta, California.

A. Figure 1 is a rumble and scratch filter which will remove the noise from the discs. I know of no commercial filter currently available which will do what you have in mind.

The filter here shown is one which was a portion of the Bogen PR-100-A preamplifier and has been reproduced here with the permission of the manufacturer.

Connect this filter between the preamplifier and the power amplifier. If you have trouble, you will have to connect it between two high-impedance stages.

I am surprised about the cactus needles which are to be used to play some of your records. Unless these discs are of the old, embossed type, etched on aluminum, there should be no need to play them with cactus needles. Of course, if they are embossed discs, this is the only method which will allow you to play them back without ruining them at the same time.

If the discs are acetate, they can be played with standard stylis with better results than are obtainable with a cactus needle.
This year again, more people will choose one of these 3 Garrard models than all other record playing components combined.

To help find the Garrard which is best for you—let us send you the new Comparator Guide.

Clearly and concisely, it describes the important Garrard advances—all of which play a vital part in insuring top performance and longer life for your records. Every Garrard model is pictured in full color...with detailed photographs, descriptions of its features and explanations of how they contribute to your enjoyment. The coupon below will bring you a copy of the Garrard Comparator Guide—without charge.
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...and it's right in your living room if your FM is equipped with a

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Broadcasting authorities agree that an outdoor antenna is absolutely essential for the reception of full quality monaural and multiplex FM sound.

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THE FINNEY COMPANY

PRODUCERS OF THE WORLD'S FINEST FM AND TV ANTENNAS
Dept. 34 West Interstate, Bedford, Ohio

There was a time when cactus needles were the rage, even though it was demonstrable that such needles deposited foreign matter in the grooves. Perhaps some of your acetate discs were recorded at that time. This vogue was with us in the late 30's and early 40's, and perhaps was the reason for the use of cactus needles.

The exact radius of the stylius used to play back the records cannot be given, but you should be able to use a 3-mil stylius to play back most records unless some of them were made using LP techniques developed after 1948. The stylius you now use to play back 78-rpm discs will do nicely.

I should point out that the use of the proper size stylius as mentioned will reduce noise to a considerable extent. If you use an LP stylius to reproduce modulation from grooves which were recorded with a recording stylius of larger radius, you will add noise and you will contribute to the destruction of the disc.

One consideration which might enter the picture is that the output from the cartridge might be insufficient to drive the tape recorder properly. Another point to remember is that by connecting the output of the cartridge directly to the tape recorder you lose the ability to remove surface noise from the discs. This was something you wanted to be able to do.

If you do use a cactus needle, you will have to use another cartridge. If this cartridge is a crystal type, connect it to the proper input of your preamplifier and connect the filter shown here as already directed. This will eliminate surface noise and rumble if either is present. Further, you can adjust the tone controls to get the best sound from the discs. The discs were probably recorded with varying equalization, most of them haphazard. Judging from my experience with home recordings. Of course, if some or all of them were recorded professionally, there will be a more uniform sound, but even here, equalization standards varied widely. Some tone compensation is welcome when you really sit down to do the job.

Amplifier Feedback Circuits

Q. Some amplifier circuits base the component values of the feedback circuit upon the impedance of the speaker system with which they are to be used, whereas other amplifiers maintain fixed component values regardless of the impedance of the two speakers. It appears to me that the more sound approach would be the first one. Am I correct in this assumption? E. X. Nuel, Bronx, New York.

A. Circuits with different feedback characteristics to suit the impedance of the speakers are designed around transformers which have just one impedance tap, say 8 ohms. This approach is inflexible and is not preferable to the systems which have multiple output taps to meet many external load considerations. The slight improvement in performance which might be gained by using feedback to suit the particular speaker impedance is so slight that its superiority can hardly be measured, let alone be heard.

My own circuit which appeared in the July, 1962, issue of Audio used the standard approach. I did consider the more inflexible arrangement, however, but found that it did not give better results. When you examine this circuit, you will see that the impedances are selectable by a switch, and I could have worked things out so that feedback could be changed along with the impedance, but I didn't feel that this would result in any real improvement.
Famous RCA Broadcast Quality Microphones
Now available through Local Distributors

When world leaders make important public speeches... when the world's greatest recording artists perform, chances are they use an RCA microphone. In service throughout the world with broadcasting stations and recording studios, RCA microphones are the symbols of quality to audio engineers everywhere.

GET FULL TECHNICAL INFORMATION. CALL YOUR NEAREST RCA MICROPHONE DISTRIBUTOR OR ATTACH COUPON TO 4¢ POSTCARD AND MAIL.
Music... soft and caressing... vibrantly alive... inspiring. The pure sound of Grommes stereo recreates each mood... with fidelity and presence of infinite superiority. Prices are sensible... quality unsurpassed.

Model 181M FM multiplex-stereo tuner. Magic bar tuning with exclusive Stereo Sentry to indicate stereo broadcasts............................. $139.95
Model 102M FM and AM multiplex tuner with all features of above.......................... $159.95

Write GROMMES
Division of Precision Electronics, Inc., 9101 King St., Franklin Park, Ill.

Grommes sets the scene...

Some Statistics

Sir:

We were pleased to see your review of the 350B FM Stereo Tuner in the July "Equipment Profile."

As you so aptly pointed out, the ingenuity (I believe you called it "daring") of the multiplex circuit in the 350B combined with the excellent sensitivity of the unit have made it one of the most value-packed tuners available. We feel it to be one of the finest FM stereo tuners available at any price.

We feel, however, that clarification of one aspect of the review would prove helpful to many readers. Though reference is made to the fact that all Scott units tested by Audio have always met advertised specifications, those for this particular unit are not given.

So that those interested might more accurately evaluate the exceptional performance of the 350B, we wonder if it would not be possible for you to publish this particular unit's specifications.

PETER INKE
Asst. Sales Manager
H. H. Scott, Inc.
111 Fowler Mill Road
Maynard, Mass.

(The rating of a product must include not only the test performance but also an informed opinion as to how long it will stay that way in essence the performance of the manufacturer. We believe the manufacturer's rating is very clear in this case, and that is why we did not give statistics. Anyhow, for those who must have some numbers—the 350B had a sensitivity of 0.2 µv (IHF), selectivity of 37 db, capture ratio of 5 db, AM suppression of better than 50 db. End)

Losses in FM-Stereo Transmission

Sir:

I have noticed that in your February, 1963, issue, and repeated again in your May, 1963, issue, that you had attributed the poor signal strength of stereo reception to FCC information which indicated "about a 30% loss." This magnitude of loss appears so low to me that I would like first to clarify our contributions of where the loss may occur. In monophonic and stereo transmissions, there are two signal-to-noise ratios of interest. One of these is the monophonic or main channel signal-to-noise ratio and the other is the signal-to-noise ratio which prevails during stereo reception. When multiplex stereo is added to an FM station, there is a degradation of the monophonic channel of a fairly small amount. The signal-to-noise ratio of the stereo reception is usually expressed in terms of a loss with respect to monophonic reception. This loss is a considerable amount, much higher than the 30% which you mentioned.

A very good source for data on the signal-to-noise ratio loss that stereo reception is the article entitled "Some Notes on the Calculation of the S/N Ratio for a FM System Employing a Double Sideband AM Multiplex" by Norman Parker, Motorola, Inc., and Donald W. Ruby, Zenith Radio Corporation, published in the April, 1962, issue of "IRE Transactions on Broadcast and Television Receivers." Norman Parker was chairman of the Signal-to-Noise Evaluation Committee on the National Stereophonic Radio Committee and developed the signal-to-noise ratio ratings which were passed on by that Committee.

Parker and Ruby calculated the signal-to-noise ratio loss obtained from stereophonic reception, as compared to monophonic, as 23 db. This means that if the signal-to-noise ratio on the main channel is 40 db, the signal-to-noise ratio for multiplex stereo reception would be 17 db. A 23 db loss is a loss of 200 to 1 in power such that a 1000-watt FM broadcasting station becomes a 5-watt stereo broadcasting station. In power, this is 90.5% instead of 30%.

In other words, the signal power has been reduced from 100% to 0.5%. This large loss is responsible for the very poor signal-to-noise conditions obtained with stereo reception. The only way that stereo reception can be brought to the signal strength of monophonic reception would be with a directivity antenna having a 23-db gain. That amount of antenna gain would call for quite a massive array.

Murray G. Croddy
Director of Engineering
Max Electronics
135 Eileen Way
Syosset, L. I., N. Y.

(Actually we said the loss would be 50-66 2/3% rather than 30%. We do agree, however, that losses are rather high and require corrective measures to ensure good stereo reception. We do not agree, as you intimate, that it is almost hopeless. We feel that the latest FM tuners have solved a good deal of the problem—in conjunction with an appropriate reasonable anten. End)

We Were Wrong

Sir:

On page 58 of your April, 1963, issue, it said: "New Orleans studios were closed then as now to Negro performers." Just to set the record straight, this studio had been in operation for the better part of 15 years. In these years, I'll say that 85 to 90 per cent of our recording is done by Negro artists and musicians.

Cosimo Recording Studios is the largest and most complete recording studio in the south. Some of the Negro artists recorded here include, Pats Domino, Irma Thomas, Lee Dorsey, Ernie K-Doe, and Barbara Lynn, to name but a very few. We have no racial discrimination here and would appreciate you setting this straight.

OLIVER C. FIFLOTT, Jr.
Chief Engineer
Cosimo Recording Studio
521 Governor Nicholls Street
New Orleans 10, La.

Audio Clubs

Sir:

A few issues back you covered the subject of Audio clubs. If your magazine is acting as a meeting place for interested prospects, I would like to submit my name for contact by other like-minded people in the general San Jose area.

OLIVER KULSTAD
514 Monica Lane
Campbell, Calif.

LETTERS

AUDIO • AUGUST, 1963
**New! Triple the length on a 7” reel!**

**Longest non-stop tape time ever!** That's what you get with a 7" reel of new SCOTCH® BRAND Recording Tape No. 290—any way you play it! At 3 1/2 ips, for example, it provides 3 hours of uninterrupted stereo or monaural—6 hours of recording in both directions.

This exclusive triple length tape offers 3600' lengths on 7” reels. That's three times the footage possible with standard length tape on a 7" reel. And compared with regular double length tape, you get 50% more recording time, pay less per foot.

What's 290's secret? A superior new coating technique, developed by 3M, makes possible thinner high potency oxide coatings to reduce tape thickness, allow bonus tape footage per reel. Backing for No. 290 is the same extra-strong, half-mil tensilized polyester used on regular “SCOTCH” Double Length Tape. No. 290 is made to demanding stereo quality standards to ensure brilliant sound characteristics. And exclusive Silicone lubrication, which lasts the life of the tape, protects against recorder head wear, actually extends tape life.

Full hour on a miniature reel! No. 290 is also offered in 600' lengths on 3 1/4” reels that fit most miniature recorders, play a full hour at 3 1/2 ips, 2 track. Ask your dealer about both sizes of new No. 290.

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**Magnetic Products Division 3M COMPANY**
MIDSUMMER IN MINHATTAN

1. Times Squaryah

Midsummer is the time when I tend to get fascinated with audio extremities—noises far from the hi-fi central area of loudspeakers, phonos, preamps, turntables, multiplex tuners which necessarily keeps me busy the rest of the long year. Vacation time. Not that my cars ever take a vacation, except when my highs are sealed off by a cold in the head. But those sounds which are purely marginal in the depths of winter suddenly, con midsommar, begin to intrude into my center of audible operations. I even begin to feel like writing about them, crazy as it may seem. Especially when I am in the Big City and must, necessarily trod the baking streets, the superheated subway, and the conditioned halls of the metropolis, come heat, come humidity, come anything. Somehow, the gentle sounds of winter are now louder and more menacing, the incidents that do not even impinge on consciousness in December begin to whistle and screech and grate and groan as June wears worry into July and even more doggedly into August...

One needs to find a bit of humor in these doggy days of super-loudness on the streets. One looks for a philosophy, a moral, a silver lining, to make a point out of the pointless jargon of cruelty that jangles in the ears from the earliest morning to the latest hours of a breathlessly hot night. Ugh.

(To be sure, I’m writing this on a brisk, chilly country day, far from the subway, the only audible noise being the rustle of my furnace keeping the house warm... but I have imagination, don’t I? I’m just thinking ahead, to Date of Publication.)

Take the public-address hi-fi that has lately been installed in the New York subway. It’s on all the new cars and it makes me laugh aloud when I’m not cringing. Cybernetica! The best of our audio machinery still is at the mercy of the errant human being who runs it, not to speak of the individuals who project vocal quality through it! Yes, the idea of an audible subway guide, a train announcer on every train, was a bright one and I can just see the enthusiastic designer who figured how to install mikes and amplifiers in multiple-unit couplings, to match the multi-unit control system of the subway cars. One motorman with each. He keeps quiet. One conductor, to open the doors and shut them with due caution. And to talk into the mike. "TIMES SQUARE NEXT... CHANGE FOR THE BMT AND SHUT-
Can you find another kit that offers so much for $99.95?

EICO ST70, 70-WATT STEREO AMPLIFIER

Beyond the performance level of these two units, possible improvements are merely marginal and very expensive. That's why with EICO's ST97 and ST70 you strike the optimum balance of cost and performance—each costs less than $100 as a kit. You can also get the ST70 and ST97 factory-wired for $149.95 each—and you couldn't find comparable wired units at the price.

If high power isn't your primary need, you can get superb sound for even less with EICO's ST40, the 40-watt counterpart of EICO's outstanding ST70. The ST40, essentially equal to the ST70 in all but power, costs $79.95 as a kit, $129.95 factory-wired.

ST70 DATA: As the center of your stereo system, the ST70 accommodates all program sources. It even has separate inputs for both turntable and record changer, preamplified tape signals and tape head with co-axial equalization for both fast and slow tape speeds. A center channel output feeds directly on a center channel speaker or, where desired, extension speakers throughout your house without any additional amplifiers. Critical parts — filter capacitors, rectifiers, output tubes—all operate well below their ratings to assure long, trouble-free life. Over-size output transformers deliver full rated power all the way down to 30 db. ... and as a kit builder, you'll like the spacious layout. We got rid of all those tight places. Kit $99.95. Wired $149.95 (includes metal cover & FET.)

SPECIFICATIONS ST70: Output Power: 70 watts (continuous sine wave 25-watts per channel) / IM Distortion: 1% at 70 watts. Harmonic Distortion less than 1%. Frequency Response: ± 0.5 db 5-50,000 cps. Inverse Feedback: 17 db. Stability Margin: 100 db. Hum and Noise Level: 43 db. Taper head — 54 db. tapers, output transformers — 78 db. (all measurements according to IHFM standards.)

ST70 DATA: Building the ST70 FM stereo tuner requires no instruments, no critical adjustments. The front end and IF stages are fully pre-wired and pre-aligned. The tunable coils of the stereo demodulator are factory-adjusted. With four IF stages plus a stable, sensitive front end, the ST70 pulls in clear stereo even under fringe conditions, and EICO's filterless zero-phase shift stereo detector (patents pending) maintains reliable channel separation. EICO's unique traveling tuning eye makes tuning simple and precise. Stereo motions are automatically identified by a pilot light. Semi-kit $99.95. Wired $149.95. (Includes metal cover and FET.)


ST79 FM STEREO TUNER

Can you find another kit that offers so much for $99.95?

EICO ST97 FM STEREO TUNER

ST97 DATA: Building the ST97 FM stereo tuner requires no instruments, no critical adjustments. The front end and IF stages are fully pre-wired and pre-aligned. The tunable coils of the stereo demodulator are factory-adjusted. With four IF stages plus a stable, sensitive front end, the ST97 pulls in clear stereo even under fringe conditions, and EICO's filterless zero-phase shift stereo detector (patents pending) maintains reliable channel separation. EICO's unique traveling tuning eye makes tuning simple and precise. Stereo motions are automatically identified by a pilot light. Semi-kit $99.95. Wired $149.95. (Includes metal cover and FET.)


EICO ST97 FM STEREO TUNER

ST79 DATA: Building the ST79 FM stereo tuner requires no instruments, no critical adjustments. The front end and IF stages are fully pre-wired and pre-aligned. The tunable coils of the stereo demodulator are factory-adjusted. With four IF stages plus a stable, sensitive front end, the ST79 pulls in clear stereo even under fringe conditions, and EICO's filterless zero-phase shift stereo detector (patents pending) maintains reliable channel separation. EICO's unique traveling tuning eye makes tuning simple and precise. Stereo motions are automatically identified by a pilot light. Semi-kit $99.95. Wired $149.95. (Includes metal cover and FET.)


ST79 FM STEREO TUNER

Can you find another kit that offers so much for $99.95?

EICO ST97 FM STEREO TUNER

ST79 DATA: Building the ST79 FM stereo tuner requires no instruments, no critical adjustments. The front end and IF stages are fully pre-wired and pre-aligned. The tunable coils of the stereo demodulator are factory-adjusted. With four IF stages plus a stable, sensitive front end, the ST79 pulls in clear stereo even under fringe conditions, and EICO's filterless zero-phase shift stereo detector (patents pending) maintains reliable channel separation. EICO's unique traveling tuning eye makes tuning simple and precise. Stereo motions are automatically identified by a pilot light. Semi-kit $99.95. Wired $149.95. (Includes metal cover and FET.)


ST79 FM STEREO TUNER

Can you find another kit that offers so much for $99.95?

EICO ST97 FM STEREO TUNER

ST79 DATA: Building the ST79 FM stereo tuner requires no instruments, no critical adjustments. The front end and IF stages are fully pre-wired and pre-aligned. The tunable coils of the stereo demodulator are factory-adjusted. With four IF stages plus a stable, sensitive front end, the ST79 pulls in clear stereo even under fringe conditions, and EICO's filterless zero-phase shift stereo detector (patents pending) maintains reliable channel separation. EICO's unique traveling tuning eye makes tuning simple and precise. Stereo motions are automatically identified by a pilot light. Semi-kit $99.95. Wired $149.95. (Includes metal cover and FET.)


ST79 FM STEREO TUNER

Can you find another kit that offers so much for $99.95?
If you’re willing to pay anything for professional quality ..........but would rather not

The Concertone 605 is for the one man in several who can’t stand less than perfection ...but can’t see why professional quality should cost so much. Never before have so many features and so much professional quality been available at this price. Read ahead carefully and see: Precision plug-in head assembly ...includes four precision heads; Separate microphone and line controls (input can be mixed); Delay memory control circuit (never spill or break tape); Automatic glass tape lifters, including electric cue feature; Sound on sound and add sound; Solenoid operated brakes; Three motors, including 2-speed hysteresis synchronous drive: Automatic rewind; Exclusive Reverse-O-Matic®. Learn all about the 605 in complete detail. Ask your dealer for a demonstration or send for free literature today.

CONCERTONE 607
Broadcast version
The Concertone 607 with higher impedance is for the true professional or broadcaster. Remote control optional. This superb tape recorder is constructed to 19" x 14" dimensions, permitting it to be used as an exact replacement for old or outdated tape recorders.

CONCERTONE 400 COSMOPOLITAN
For people on the go ...it’s the Cosmopolitan - Combination Tape Recorder with AM Radio. A versatile companion and co-worker for business or pleasure travels. 5" reel capacity. Push-button operation. Amazing fidelity. Remote mike. Foot-pedal control. This all-transistorized recorder has big recorder features in miniature form.

2. Trash Can

Another bit of humorous P.A. in the Big City was revealed to us recently by the newspapers. A most clever idea, with a worthy aim. The Talking Trash Can.

You see, a mere P.A. loudspeaker these days, no matter how hi-fi, is unlikely to gain more than marginal attention from our overworked city ears. If it isn’t background music in restaurants and banks and supermarkets or squelchy rock and roll on tiny transistors (they are neither hi-fi, nor stereo), then it is endless public announcements of the sort one never listens to, corresponding to those unlikely signs in the subway entrances which warn us croaky-voiced souls not to run or jump down the stairs. (As if those who can run and jump, the small kids, are ever going to read them!)

A P.A. announcement is an invitation to studied deafness in Manhattan, even when it is actually intelligible. And none is worse than the endlessly repeated recorded message, dropped out monotonously at passersby who never listen—or curse if they do. My favorite hate is the one in the 14th Street Union Square subway station, which belts out over and over, night and day, something about keeping back from the moving platforms when the train is in the station. A million times a week, and a million people hate it, I’m sure.

And so if you were to set up a talking trash can on the street with a recorded message about how you people are supposed to dispose of litter in the proper containers, not one in a thousand people would even take notice. Who listens to loudspeakers, and who likes public service warnings?

So somebody in New York had a really brilliant thought—he’s devise a talking trash can that’s different. This one talks BACK. Wow, what a gas that will be!

Man with mike stations himself in second story window. Down below, trash can has speaker, plus mike, for two-way communication.

Pretty gal drops her chewing gum wrapper on the street. Trash can says, Hey—don’t do that, lady! She jumps at least a foot and crowds instantly materialize. Don’t you know you’re not supposed to ...? The lady by this time is so stunned she can’t move, let alone open her mouth. Trash basket gently coaxes her. And before you know it, she’s talking. Right in front of all those passersby. A lively conversation ensues, while photographers snap the people of New York actually looking fascinated—which is something. Front page news.

 Somehow, though, the best idea goes awry. The New York Times quoted verbatim a conversation between this lady and the trash can. It seems not to have stuck to the point, which is what really mattered. That chewing gum wrapper.

"What’s your name?" The Times said the box said. "My pen name!" "Any name," it answered patiently. "I don't talk to trash cans. I'm a writer and my work does not belong to you," says she. "What do you write?" it asked, going along with the irrelevance. "Everything. Novels—everything."

The Times says that the trash can asked what was the name of her best novel. She answered 

Surely (Continued on page 70)

for further information write: AMERICAN CONCERTONE, INC.
A DIVISION OF ASTRO-SCIENCE CORP.
9409 W. JEFFERSON BLVD. • CULVER CITY • CALIF.

10 AUDIO • AUGUST, 1963

www.americanradiohistory.com
the beginning of a new quality standard for stereo

STEREO headsets will never replace stereo speakers—however, more and more people are now learning about the significance of a high quality headset as a component in a high fidelity system.

Perhaps you will soon be one of the many people who will pick up a stereo headset and try it—out of curiosity . . . to hear how it sounds . . . to feel how it fits . . . to think about the many ways the stereo headset will expand the benefits of your high fidelity system.

When that time comes—we suggest you take along the following check-list. Here are the meaningful features you should look for in a fine quality headset receiver.

- **CONSTRUCTION**
- **COMFORT**
- **COUPLING**
- **PERFORMANCE**

Be sure the construction of the headset is lightweight, and substantial to withstand continued use. Adjustment on the head should be almost automatic. Extreme comfort is essential for hours of personal listening enjoyment. Coupling of the receiver to the ear is a most important characteristic—close, direct coupling assures maximum abatement of external sounds and reinforcement of bass and treble frequencies. Performance must be equal to the best high quality speaker system. More important—try the DAVID CLARK/100 at the start. Exclusive Direct Acoustical Coupling brings the rich natural quality of music to your ears . . . gives you a true quality standard, a reference for judging the performance quality of all headset receivers.

High Quality Personal Headset Receivers and Accessories for Stereophonic and Monophonic Applications.

David Clark COMPANY, INC. WORCESTER, MASS.
new and unique
Type 8417 output pentodes with cavity anode design.

new and unique
Totally resonance-free ultra-wide-band output transformers.

new and unique
Triode-connected dual power-pentode driver stage.

new and unique
Oscilloscope-type cathode-follower input stage with compensated attenuator.

new and unique
Hinged cover for rarely used controls (bias and balance).

old and unique
Introducing the 150-watt SA-1000 stereo power amplifier...by a maker who needs no introduction.

After more than 25 years of serving the high fidelity perfectionist's needs, Fisher still has the same policy on brand-new engineering projects: all-out or not at all. Nowhere is this uncompromising philosophy more eloquently demonstrated than in the case of the new Fisher SA-1000 stereo power amplifier.

The SA-1000 represents Fisher's first entry in the highly specialized class of extremely high-powered dual-channel basic amplifiers. There has been no scarcity of advanced equipment in this heavy-weight category; excellent high-wattage stereo power amplifiers of well-known makes have been available at prices starting in the $230-to-$270 range (for factory-wired kits) and rising all the way up to $648 (for a pair of single-channel models of very de luxe construction). What does it mean, then, when Fisher finally decides to match its own contender against such formidable competition and sets the price at $329.50?

To those who know Fisher, it can mean only one thing: Fisher has exhaustively tested, measured and evaluated all these other power amplifiers in its own laboratories and found the SA-1000 to be distinctively superior to all of them, regardless of price. As for the price tag, it happens to be in the low 300's rather than the 400's or 500's solely as a result of Fisher's unusually large and technically unmatched manufacturing facilities, geared for heavy initial production in anticipation of demand.

The Fisher SA-1000 is a challenge to the severest critics and most discriminating judges of professional sound reproducing equipment, both as to specifications and listening quality. Its music power rating is 150 watts IHFM Standard, with both channels driven. The RMS power rating, again with both channels driven, is 130 watts (65 watts per channel). However, as a glance at the intermodulation curve will show, each channel will deliver 80 watts at 0.5% 1M distortion, thus indicating the extreme conservativeness of the official rating.

The output stage of the SA-1000 is engineered around the newly developed 8417 beam power pentodes, never before used in any electronic device. Designed specifically for use in this amplifier, the 8417 offers extreme linearity, resulting in greatly reduced distortion, and has unusually low drive-voltage requirements, permitting the previous stages to 'coast' at their lowest possible distortion levels. The unique cavity anode design of the 8417 is an important factor of its superior performance characteristics.

Frequency Response (0 db = 4 watts)
Subsonic Filter: Dotted Line

Each pair of 8417's in the SA-1000 drives a giant output transformer via plate-cathode coupling — a modified and improved 'ultra-linear' configuration that provides 12 db of the most desirable and stable type of negative feedback in the output stage. The custom-wound output transformers are unlike all others in that their response rolls off below 5 cps and above 200 kc without the slightest peaks or dips. (See the frequency response curve.) This results in exceptional stability and superb square wave reproduction.

The driver stage, too, is entirely novel. A triode-connected 6U8/EI880 dual power pentode circuit developed by Fisher engineers is capable of delivering 40% more drive to the output stage than is required — and at a remarkably low impedance. The result is very low distortion, the fastest possible recovery time, great stability and hence outstanding transient response.

For the pre-driver and phase inverter stage, an ECC83/12AX7 dual triode is used in a DC-coupled cathode configuration characterized by extremely low distortion and phase shift. A feedback loop from the output transformer secondary to the pre-driver cathode provides 17 db of distortion-reducing feedback.

The input stage of the SA-1000 is of a type widely used in laboratory oscilloscopes but never before in high-fidelity amplifiers. A compensated input attenuator in conjunction with a cathode-follower circuit permits adjustment of the input signal from 0 db to -12 db in closely calibrated 3 db steps without the slightest effect on input impedance and frequency response. This feature in effect provides five different input sensitivities, ranging from 0.7 to 2.75 volts (for full rated output) so that the preamplifier volume control can be operated strictly within its optimum range.

A switchable subsonic filter has also been designed into the input stage, in keeping with the widely held engineering opinion that, for the majority of practical applications, responses should be flat down to 20 cps only and then fall off as rapidly as possible. (See dotted part of frequency response curve.)

The power supply of the SA-1000 is one of the most elaborate ever used in a stereo power amplifier. Regulation and filtering are of the highest order and all silicon diodes as well as filter capacitors are most conservatively operated.

Bias and balance are readily adjustable on each channel by means of the built-in laboratory-type calibration meter, but the controls for these rarely needed adjustments are ingeniously concealed behind an attractive hinged cover — another Fisher exclusive.

These are the most important facts and figures. You cannot fully evaluate the Fisher SA-1000, however, simply by reading about it. A comparative listening test at your dealer is an absolute must in this case. Then you will know that, even in this exalted category, not all power amplifiers sound exactly alike and that the most flawless of them all costs only $329.50.

FISHER HANDBOOK

FISHER RADIO CORPORATION
21-29 44th Drive, Long Island City 1, N. Y.

Please send free 40-page handbook, plus detailed brochure on the Fisher SA-1000 Stereo Power Amplifier.

Name
Address
City Zone State

*SLIGHTLY HIGHER IN THE FAR NORT. RATES: FISHER RADIO INTERNATIONAL, INC., LONG ISLAND CITY 2, N. Y. TRADING ASSOCIATES LTD., MILDENHALL, ONT.
The RCA Victor LP 70062 records are in the Dynagroove process. This is not to be taken as a sign that Victor has decided to drop the juggling of release dates on the part of RCA, listeners who prefer to take their sound straight have been granted an interval to do so.

This stereo disc by the Norman Luboff Choir has been released in a beautifully recorded version that moved back a month on the release schedule in order to get the Dynagroove product into dealers' stores at a time when the own-label campaign on the process was set to roll. Changes in the process of Dynagroove's severely restricted dynamic range and frequency response this virtually direct recreation of the sound of the Luboff choir is as intoxicating as the breezes they sing about in this music of the islands of the central Pacific Ocean. Although the chorus is no closer to Polynesia than the Hollywood studios of RCA Victor, it turns in a virtuoso job in the exquisitely recorded rhythm of Hawaii and Tahiti. Add to it the NLC's near-perfect record of this music, the beautifully machined teamwork of this polished singing group and you end up with a Hawaiian album unique in the record industry. Taking one selection at random, the Hawaiian War Chant, a burs-conquering folk melody by any average recording, becomes a truly novel experience in the perspective provided by the full-range stereo available in this release. Recording engineer Al Schmitt, RCA's top man in the West Coast, has ample reason to be proud of his mike work at this session. In his handling of the male and female halves of the chorus, Schmitt has evolved a mixing pattern that could serve as a model of stereo that has been a long time coming. RCA has maintained full identity of contrasting vocal textures with the gap between lead speakers frequently encountered whenever re-recording striving for maximum contrast in a stereo mix.

The World's Great Love Songs
London Tape LPM 70062

Encouraged by the success that other labels have been having in the assignment of operatic arias to programs of light mood, London has decided to put out an album of popular love songs by tenor star, Mario Del Monaco. Had London left it at that, record dealers and customers around the world probably would have paid no more attention than they do whenever any top operatic name invades the pop market.

Instead, some unsung marketing genius on London's staff got the idea to combine the box office appeal of two best-selling names on its roster and brought Mantovani's London orchestra into the Del Monaco recording session. Once the project reached that stage of planning, it was soon obvious that such a smash hit to receive the devoted attention the label could give it. A long-standing point was the selection of the still unexcelled melodies of Kingsway Hall, where many of London's finest recorded session have been made.

For all these undeniable attractions, the one factor in this recording that arouses most of my curiosity is the very element that London itself had nothing to do with. I'm sure any tape fan will agree that it is the transfer to four-track tape (studied in the country by United Stereo Tapes) that is the greatest attraction on this Monaco/Mantovani reel. It was foolhardy to assume that the transfer process from master tape to the commercial four-track product can take all the credit for an exceptionally fine reel. There's very little, all that, and the USF can do in its copying procedure to improve a lackluster master. The fortunate circumstance here is the fact that a very good master tape has been given one of the first transfers I've encountered so far on a USF product. At a playback level that would bring in tape hiss on earlier releases, this reel presents a highly impressive background silence. Yet the tape is not locked with a reckless amount of signal level as in past efforts to keep down the amount of background noise. There is no distortion here even when Del Monaco belts his way into the climax of a tenor specialty along the lines of "He My Love" or the Serenade from Romberg's The Student Prince. His English lyrics, unfortunately, are more exotic than they are understandable, the text is more and more a mass of syllables when handling Italian lyrics. One gets the impression in the English songs that Del Monaco's command of his language is just about enough to get him through a periodic discussion of the text in the London Recordings. As for the accompaniment provided for the star of the album, Mantovani turns in a very creditable job. He is too experienced a showman to intrude upon the soloist when the tenor is singing in a lyre yet the lush support is always at hand to turn this release into a highly listenable product.

Victory in Review
London Tape LPL 74024

In recent years, within the category of its Phase 4 Stereo Series, London Records has been making a speciality of parades that travel the distance between one's loudspeakers. When the idea was first conceived, the components of the parades were made up of musical and non-musical units that you could expect to find in any self-respecting parade. The reviewing staff midway between your speakers was apt to be draped about the personnel parading past represented many nations, including the latest pan-American review. "spectacular" calls upon the listener to exercise more imagination. Some of the more interesting units are songs, such as those written by such outstanding composers as Cole Porter and Jerome Kern. London's handling of such units is well enough done, and one is left wondering what the gap between the tape and the scene was.

This Phase 4 tape is considerably cleaner in sound than anything released so far in this particular series of tapes. Not only does it surpass other Phase 4 items, its response is superior to one of my favorite London tapes put out in its regular stereo. The sounds of Victory by the Band of the Grenadier Guards on LPM 70282.

Victory in Review, directed by Eric Rogers, begins with a recreation of scenes of triumph in ancient Egypt as conceived by operatic composers. The Triumphal March from "Aida" and the Chorus of Hebrew Slaves from the opera " Nabucco" are two processions which, impressive though they may be, are perhaps no longer the Primary News on Parade. London, with the help of some of its top recording talent, has created a magnificent replica of the march of the Hebrew Slaves to the lion's share of the market. Going back to the晓得 March from "Aida" is the Marche Loraine. London's handling of the tubas and drums is really sensational. There is a vividness and punch to this track that is most conspicuous.

Bye Bye Birdie (Original Sound Track)
RCA Victor LOS 1081

RCA's promotion department appears to be operating on the assumption that 1963 is going to contain less than the usual number of months. Although this record was released just after the film was released, it already carries a banner announcing that Bye Bye Birdie is the "Best Film Musical of the Year." Even if we accept this possibility that the other record labels have divested RCA's release schedule on film music for the rest of 1963, such an announcement on the cover of the album is still on the silly side. The contents alone are sufficient to challenge so sweeping a statement.

In the first place, "Bye Bye Birdie," in the original version that hit Broadway some three years ago, hardly ranked in a towering position among the many broadway hits. But all its songs, only one—Put On A Happy Face—achieved any real recognition in the show world. Andy Williams, who played the father, and the worshiping fans surrounding him offered only mildly amusing satire in the theater and on the Columbia Original Cast recording (KOS 2092). On the evidence of this LP, it is possible to say that whatever was lost in the Broadway production has been completely lost in the transfer to the screen. Andy Williams and Janet Leigh are on the same side of the Charles Strouse musical score with the Van Dyke and Hayley Mills as the leading male roles. Pearson, who appeared in the "Bye Bye Birdie" road company, makes his film appearance in the role of Chorus Star, the entire cast lobs under a distinctive handicap in the dated sound turned out for the soundtrack by Columbia Pictures. LSP
PIONEER . . . . FOR A NEW PRICELESS ADVENTURE IN SOUND

From PIONEER comes the SM-600, a complete stereophonic tuner-amplifier featuring outstanding sensitivity in its tuner circuits and ample power output sufficient enough for the largest systems.

The FM section features the latest RF circuit using a Nuvistor for maximum sensitivity and stability. It also includes a built-in multiplex circuit for efficient reception of FM multiplex stereo broadcasts with full stereo effect.

The AM section features a tuned RF circuit for sensitive low-noise reception of broadcasts.

SM-600

The preamplifier is designed for maximum versatility. Its many inputs allow the handling of every possible external program source. From the outputs pour a full 40 watts of clean and undistorted power per channel in stereophonic operation or 80 watts in monophonic operation. See the SM-600 at your dealers, or write directly to PIONEER for additional literature.

SPECIFICATIONS OF THE SM-600

FM SECTION  
Circuitry: Cascade R.F. tuning circuit; Frequency Range: 88~108 Mc; Sensitivity (HFM rating): 1.5/mV; Signal to Noise Ratio: 50 dB

MULTIPLEX SECTION  
Channel Separation: Better than 30 dB; Circuitry: Super heterodyne circuit with tuned RF stage; Frequency Range: MW, 535~1,650 Kc

AUDIO SECTION  
Circuitry: Power tube 7189-A, AB-PP fixed bias output circuit; Music Power Output: 40 watts per channel; Frequency Response: ±1 dB from 15 cps to 100 Kc; Input & Audio Sensitivity: Magnetic 2.3 mV, Tape Head 1.5 mV, Crystal (Ceramic) 23.0 mV, Auxiliary 165.0 mV, Tape Play 165.0 mV; Power Requirements: 115/230 volts, 2.1/1.14 amp, 208 watts IMAX; 50~60 cps; Tubes: 20 tubes, 11 diodes; Dimensions: 17 7/8 x 5 1/2 x 17 inches; Weight: 38 lbs

DISTRIBUTORS

West Germany: C. Melchers & Co., Schlachte 39/40 (P.O. Box 29), Bremen
Belgium: SYMA, 94, Avenue Louise, Bruxelles 5
Italy: Prod-El S.p.A., Via Monfalcone 12, Milano

PIONEER ELECTRONIC CORPORATION
5 Otowacho 6-chome, Bunkyo-ku, Tokyo, Japan

AUDIO • AUGUST, 1963

www.americanradiohistory.com
EDITOR'S REVIEW

FM-StereO TunER StANDARDS

In this issue we present an article by a well-known engineer who discusses the relative importance of the various attributes of an FM-tuner. Amidst the technical verbiage a rather interesting fact emerges—FM parameters are not standardized as are the mono FM-tuner parameters. There is a complete set of IIF measurement standards for mono FM tuners; there is not a comparable set for stereo FM tuners.

What does this mean?

First of all it means that most of the specifications issued for FM tuners are mono, even when the specifications refer to a stereo tuner. Secondly, it means that stereo tuners are being described as if they were mono tuners. The significance of this is revealed by the relative importance assigned to the various parameters by Mr. von Becklinghausen—he considers that mono tuner parameter, sensitivity, as much less important for stereo. In fact, the parameter he considers most important is one that is hardly ever mentioned in connection with mono tuners (although it is important for them too). Of course, there may be some difference of opinion as to the relative importance of the various technical characteristics of a stereo tuner. But there should be no difference of opinion about the need for the same kind of standards we now have for mono tuners.

We would like to point out that the existing standards have really been quite excellent in describing mono FM tuners. One need only examine lists of specifications, such as we present in this issue, to realize that when the magic letters IIF are added to a specification, we are in a position to compare—validly. For those consumers who care to take the trouble, outrageous claims based on “special” measurements can be deflated.

We need the same type of pin-prick for stereo tuners.

To ERR is HUMAN . . .

Not too long ago we presented an article describing the sound-reinforcement system at Philharmonic Hall. In the process of gathering the information we had occasion to visit the Hall several times, and to listen to performances. We tended to agree with the prevailing opinion that some deficiencies existed in the acoustics. In fact the acoustical designers admitted these deficiencies.

Unfortunately, from the first performance in this Hall, a hue and cry has been raised which finally culminated in a “committee of experts” reviewing the acoustical “condition” of the Hall and recommending changes. Frankly, we think the procedure in this area has been degrading and unethical.

We think that the performance of some segments of the press has been patently unfair in condemning a concert hall which was admittedly unfinished. Secondly, the relatively vicious attacks (all politely Phrased of course) on the acoustical designers served little purpose but to fatten already fat egos. Thirdly, the learned but razor-sharp barbs of otherwise sedate engineers and scientists have been degrading.

Lest we be misunderstood, let it be clear that we are not defending the mistakes, or the acoustical engineers. We are defending the right of engineers, all engineers, to err and be given the opportunity to correct their admitted mistakes, without being denigrated. Especially when as in this case, the engineers had the humility to admit at the outset that they expected changes would be necessary after about a year.

Perhaps the saddest part of this whole episode is that unrelated forces have combined to obscure the fact that much important and creative thought went into the acoustical design of Philharmonic Hall. In spite of the mistakes, this design is one of the most successful to date for its purpose. One must consider that the intention was to achieve a large hall for multiple purposes. They succeeded.

Some have said it is a mistake to build concert halls as large as this one. Others say it is a mistake to build halls for the variety of functions (in fact and fancy) which Philharmonic. A few even say that we should build halls which are the exact duplicates of those which are known and loved. Perhaps all these proposers are right, we don’t know. What we do know is that we must encourage those who are seriously attempting to create excellent concert halls, even if they are occasionally less than perfect. Aren’t we all?

. . . To Forgive Divine

Speaking about being less than perfect, we are taking the unusual step of casting ourselves on your mercy, “before the facts,” as it were. We apologize in advance for all those errors (in fact and fancy) which sharp-eyed readers will discover in the product preview section. Frankly, we don’t think there are any errors. Certainly we spared no effort to make it error-free. Except for a few places.

By the way, we would appreciate hearing from you as to ways we might improve this section. As you know, we have reviewed products in our August issue for several years now. Over this period of time we have gradually improved the method of presentation to provide maximum information with minimum time. Could we do better? You tell us.

New York High-fidelity Show

This year, the New York High Fidelity Show will be held, as in previous years, at the New York Trade Show Building at 35 St. and 8th Ave. Dates of the Show are Sept. 11–15.

Naturally this is an excellent opportunity for audiophiles, and their friends, in the New York area to see the products listed in our product preview section.

If you wish to avoid standing on those inevitable long lines waiting to buy tickets, we suggest you send your $1.25 admission fee to the Institute of High Fidelity, 516 5th Ave., New York, N.Y. They will mail you your ticket, plus other pertinent information.

By the way, we understand a special effort is being made this year to provide interesting exhibits for the female music lovers. Bring one with you.

Our Best Wishes—

Go to this month to C. M. “Cliff” Edwards, Director of Advertising and Sales Promotion of Heath Company, who is retiring after almost 20 years of service. Well known throughout the industry and amongst kit builders, his smiling face will be missed at all future gatherings of the audio fraternity. Enjoy all that fishing and boating, Cliff, you’ve earned it.

AUDIO • AUGUST, 1963

16
a jewel for Garrard

Plug-in head assemblies with pre-mounted cartridges for Type A and Model AT6 Garrard Automatic Turntables.

Choose the right pickup for your Garrard installations — choose a Pickering — the new U38/ATG and the famous U38/AT are both available premounted in Plug-in Heads for Garrard Type A and Model AT6 Automatic Turntables.

FEATHERWEIGHT OPERATION — for maximum record protection, 1 to 3 grams tracking (recommended 2 grams) — where environmental conditions permit light tracking forces.

GA/38ATG — for Garrard Type A
G6/38ATG — for Garrard Model AT6
Includes U/38 Stereo Fluxvalve Cartridge (premounted) with D3807ATG Golden SAFE V GUARD® "Floating Stylus"

STANDARD OPERATION — for use where environmental conditions require a nominal tracking force of 4 grams or more.

GA/38AT — for Garrard Type A
G6/38AT — for Garrard Model AT6
Includes U/38 Stereo Fluxvalve Cartridge (premounted) with D3807AT SAFE V GUARD® "Floating Stylus"


Featuring Pickering’s exclusive "floating stylus"...so little mass that it actually floats on water...so light it "floats" over the surface of your records. The Pickering "floating stylus" action protects the diamond and the life of the record while it plays.

FOR THOSE WHO CAN HEAR THE DIFFERENCE

PICKERING & CO., INC., Plainview, N.Y.
Why Sherwood "zeroed-in" on the problem of tuning accuracy

The wider band requirements for the stereo information now being multiplexed on FM channels has made precision tuning a factor more-important-than-ever in FM reception.

Tuning eyes are good. Peak meters have value. But, these are yesterday's achievements applied to today's and tomorrow's needs.

This is why Sherwood engineers have incorporated a professional, zero-centered meter in the new S-3000Y Tuner. It tells when you are exactly on frequency. No guesswork. No maybe's. Only assuredness!

Third, you will just plain appreciate the added professional touch Sherwood has added to an already professional-quality FM tuner.

A bonus in tuning ease

Added to the professional accuracy of zero-centered meter tuning, Sherwood gives you a "can't-be-fooled" Stereo Indicator Light. Stereo broadcast identification is instant and positive.

This restless attention to all the details which can improve performance is why Sherwood components have been... and will continue to be... outstanding values.

Other value features of the S-3000Y

- Superb sensitivity: 1.8 µV (IHFM) for -30 db. noise and distortion.
- Wide-band 3-mc. Gated-Beam Limiter and 1-mc. Balanced Ratio Detector: combine to suppress background noise introduced by stereo FM and create the pace setting capture effect of 2.4 db.
- FM Interchannel Hush: eliminates the "rushing" noise between stations.
- Flywheel tuning: made with turntable accuracy for smoothest, fastest tuning.
- Dial spread: communications-type 20% longer scales provide professional accuracy.
- Price: $165.00 (less case).

If you want a component that combines tuner and 80-watt stereo amplifier in one compact chassis... see the new S-8000Y FM Stereo MX Receiver. Has zero-centered professional tuning meter and Stereo Indicator Light. Price: $319.50 (less case).

For complete information write Dept. A-8 Sherwood Electronic Laboratories, Inc.
4300 North California Avenue, Chicago 18, Illinois
FM Tuner Characteristics—and Their Relative Importance

DANIEL R. von RECKLINGHAUSEN

The advent of FM-stereo broadcasting, the growing number of FM stations, plus new FCC rules, are changing the technical requirements of FM tuners. Our author, a leading FM-tuner designer, gives his opinion as to the technical specifications which are essential, and the relative weight of each. He contends that sensitivity, previously considered very important, is now a less important yardstick.

In Two Parts—Part I

WHEN ELECTRONIC EQUIPMENT is advertised for sale to the ultimate user, there is always the tendency to try to describe its over-all performance by applying a single number to one of the characteristics and letting it go at that—often for lack of space to describe the item more fully. The casual reader of advertisements is all too familiar with such descriptions as "the . . . television set with 20,000 volts of picture power;" or "the . . . 2-microvolt FM tuner."

It is perhaps for this reason that such an undue amount of importance has been attached to the sensitivity of an FM tuner. Sensitivity is one aspect of a tuner’s performance, but it is by no means the only important criterion—and certainly is not the most important. There are specifications that will prove far more meaningful insofar as actual performance is concerned. It will be one of the purposes of this discussion to indicate what these important points are, and thus place all major performance aspects of an FM tuner in their proper perspective.

The importance of other tuner characteristics becomes even more evident when dealing with tuners designed for FM-stereo reception. The necessity of handling subchannel modulation components requires a different tuner design than one for optimum monophonic reception. Further, if an attempt is made to optimize one single performance aspect (i.e., sensitivity), serious degradation of more important performance aspects will result.

The advent of FM stereo, and the continuing increase in both number and strength of FM signals, requires a tuner design which provides best performance on signal-handling requirements of the future rather than one which was optimized for conditions existing in the 1950’s. On present-day high-quality tuners, optimum sensitivity is closely approached. (Theoretically it is not feasible to exceed a sensitivity figure better than 1.9 µv IHF for a mono tuner; 2.45 µv IHF for a stereo tuner—at all frequencies of the band.)

At this point, let us examine the conditions under which a tuner has to operate. At least 90 per cent of all FM tuners are used in urban and suburban areas where between 1 and 25 local stations provide a strong signal at the antenna. These signals may produce between 1000 microvolts and several volts (yes, several million microvolts) at the antenna terminals of the tuner. Any FM tuner sold for high-fidelity purposes will not have any particular difficulty receiving these local signals. In the near future, however, these signals are likely to increase rapidly in number in many areas (except congested metropolitan areas) because of the broadcasters’ increasing interest in FM and the FCC’s new FM station assignment table. These signals are also likely to increase in strength because of the recent ruling creating a new class of powerful FM stations and permitting a power increase for many existing stations.

1. Crossmodulation Rejection

The increase in power will increase the station’s service area but also will make receiving conditions in its present area poorer because of “blanketing.” Blanketing is a phenomenon by which a local station is received at more than one (the desired) spot of the dial, thereby obliterating or “blanketing” the signal of one or more weaker-signal stations. It is caused by a form of distortion originating in the front end of the tuner, known as “crossmodulation.” Crossmodulation occurs when the signals from strong local stations and from the local oscillator of the tuner combine to form distortion and intermodulation products because of non-linearities in the front end. This can be counteracted to a large degree by designing the equipment for high crossmodulation rejection. As measured by IHF standards, the rated amount of crossmodulation rejection (for example 50 db) is a measure of the dynamic range of r.f. signals which a tuner must be able to handle without performance degradation.

Table 1. The author’s listing of minimum performance standards in order of importance. It is his contention that the latter criteria may be sacrificed for the former. Thus, for stereo and future requirements, we can no longer rely on a single number such as sensitivity.

<table>
<thead>
<tr>
<th>Requirement</th>
<th>Standard</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Crossmodulation rejection</td>
<td>70 db or more</td>
</tr>
<tr>
<td>2. Selectivity (alternate channel)</td>
<td>30 db or more</td>
</tr>
<tr>
<td>3. High-frequency distortion (subchannel)</td>
<td>3% or less</td>
</tr>
<tr>
<td>4. Detector bandwidth</td>
<td>800 kc or more</td>
</tr>
<tr>
<td>5. Capture ratio (mono)</td>
<td>Detector capture ratio plus</td>
</tr>
<tr>
<td>6. AM rejection</td>
<td>0.9 to 2.5 db</td>
</tr>
<tr>
<td>7. Pulse-noise rejection, off station</td>
<td>40 db or more</td>
</tr>
<tr>
<td>8. Shape of signal-to-noise ratio curve</td>
<td>None audible</td>
</tr>
<tr>
<td>9. Difference in signal between 30-db S/N to 30-db IHF</td>
<td>Close to Fig. 9</td>
</tr>
<tr>
<td>10. IHF sensitivity (for stereo tuners)</td>
<td>3.5 ± 0.5 db</td>
</tr>
</tbody>
</table>

tuner can accommodate without difficulty.

A listener to FM programs frequently depends on signals of stations outside of his local area to provide him with programs of his choice. Any obliteration of such signals by crossmodulation (or blanketing) robs him of the advantages of a highly sensitive tuner; the tuner may be unable to pick up programs arriving with a signal strength many times stronger than required by the sensitivity of his tuner. In essence then, the amount of guaranteed crossmodulation rejection is the most important specification of a tuner. The larger the number the better, and every 2 db better is more important than a 0.5-microvolt improvement in sensitivity of a tuner.

2. Selectivity (Alternate Channel)

Local FM stations are usually assigned to channels 800 kc or more apart and the stations in adjacent cities are "dropped into the slots" in between. At times, these stations are assigned the adjacent channel (200 kc away) but usually they are in the alternate channel (400 kc away). To be able to receive the stations in the next city, the tuner has to be sufficiently selective to discriminate against the local station. Offhand, this would seem to be an easy thing to do since a station can modulate with 75 kc deviation from its assigned frequency, occupying apparently only 150 kc, leaving a 50 kc guard band between channels, as shown in Fig. 1. However, the spectrum space occupied by an FM signal is wider than twice the deviation as shown in Fig. 2. The FCC allows a total of 240 kc or 120 per cent of a channel although the usual spectrum occupancy is less than that.

In order to receive the desired signal with less than 1 per cent distortion at all monophonic and stereophonic modulating frequencies, all components to at least -40 db, or 1 per cent, must be preserved in their normal relative strength, and an i.f. bandwidth of at least 265 kc is required. Similarly, if 3 per cent distortion is permitted at certain frequencies, a 225-kc bandwidth is required. Special filtering techniques can reduce the required bandwidth a little, but the fact remains that sufficient selectivity to receive consistently all stations adjacent to local stations can be obtained only if distortion is allowed to rise unduly high when listening to any station, local or distant. Even with very wide i.f. bandwidth there will be attenuation of signals from alternate or further channels.

The IHIF provides a test for alternate channel reception and again, the highest number shows best performance. This, then, is the second most important specification.

3. High-Frequency Distortion

(Sub-channel)

It is not too difficult to obtain high selectivity in an FM tuner if other performance aspects are neglected. Perhaps the factor most readily affected is distortion, and particularly high-frequency distortion, and most particularly distortion of the signal components in the stereo sub-channel.

It is difficult to describe how distortion in a frequency modulated signal occurs and how the i.f. section of a tuner affects distortion. For the following analysis it is presumed that the limiter and detector sections of the tuner cause substantially less distortion than the i.f. section.

Whenever an FM signal generator or an FM transmitter is modulated by an audio-frequency signal, say 15 kc, to a deviation of 75 kc, the total power output of the transmitter remains exactly the same throughout the modulation cycle since only frequency has been changed. However, the total power now is distributed among the various sidebands spaced symmetrically in successive intervals (here, 15 kc) about the carrier frequency. These sidebands are actually infinite in number although their strength decreases quite rapidly the further they are removed from the carrier.

With a deviation of 75 kc, or "100 per cent," and an audio frequency of 15 kc, a modulation index (m) of 75/15 = 5 is reached. At the moment of peak deviation, the sidebands (known as Bessel sidebands) can be added to the carrier in vector form to show what happens. Figure 3 shows that for no modulation (m = 0) no sidebands are created and the total output is that of the carrier. While modulating 15 kc audio to ±3 kc deviation (m = 0.2) or "4 per cent" modulation, the first set of sidebands appear, causing the transmitter to shift ±11.5 deg. in phase.

With as little as 7.5 kc deviation (15 kc audio, m = 0.5), the second set of sidebands occurs, ±30 kc away from the carrier. When the transmitter is modulated 100 per cent or 75 kc deviation with 15-kc audio (m = 5), eight sets of sidebands occur. They are located 15, 30, 45, 60, 75, 90, 105, and 120 kc away from the carrier. It can also be seen that the sidebands are shifted successively 90 deg. in phase from each other and the carrier. Also, for m = 5, the carrier and the first set of sidebands are shifted 180
deg. from their normal orientation because of negative Bessel values. It should be noted that the relative magnitudes of the sidebands and the carrier depend upon modulation index. In all cases, the resultant vector sum of the carrier and its sidebands will remain equal in magnitude to the unmodulated carrier because transmitter power has not changed.

When the modulated FM signal is passed through a filter, such as an FM tuner, the bandwidth must be sufficiently wide so that none of the sidebands are attenuated and there is no phase shift, if the signal is to remain undistorted. Also the signal would be unchanged if carrier and sidebands were passed through a sufficiently wide filter which has phase shift proportional to frequency ("linear" phase shift.) Here, carrier and sidebands would be delayed simultaneously by a constant amount, as they would be in a properly terminated transmission line.

If, however, the phase shift of the filter is not linear with frequency, the 90-deg. phase shift between successive sidebands would be altered; the value would be larger or smaller, depending upon the error. Then, because of vectorial addition of carrier and sidebands, the resultant would not be equal to the unmodulated carrier and incidental amplitude modulation at primarily 3rd, 5th, and higher odd harmonics of the modulating frequency will occur.

A good limiter will, of course, remove this amplitude modulation but will not be able to remove the phase shift which has occurred because the resultant is now at a different phase angle. This additional phase shift at the input to the FM detector varies throughout the modulation cycle and is, of course, frequency modulation, but at a harmonic of the modulating frequency. In simple words, non-linear phase shift causes harmonic distortion in FM which increases with modulating frequency and with deviation.

A way of showing the effect of non-linear phase shift without recourse to vector diagrams is to consider the non-linear phase shift of the filter as a linear portion (amounting to the carrier frequency delay of the filter) and a non-linear portion with a 0-deg. slope at the carrier frequency, as shown in Fig. 4. If the carrier is now considered to change in frequency due to modulation, the phase of the carrier is increased at the "positive" modulation peak from its center position and decreased at the "negative" peak. At higher modulating frequencies this phase-shift change occurs more rapidly, and at higher amounts of deviation it is more severe. Since a phase-shift change varying with time is frequency modulation, an additional amount of modulation has been created at harmonics of the original modulating frequency—that is, distortion increasing with modulating frequency and deviation.

All this indicates the definite need for phase-linear i.f. filters in FM tuners, particularly those used for stereo reception since very high modulation percentages can occur at high frequencies. A band-pass filter is supposed to pass
only desired frequencies and reject all others. An i.f. amplifier with its tuned circuits is one form of band-pass filter, selecting in this case a band of frequencies about the intermediate frequency of a tuner. What kind of response should such a filter have?

The previous discussion definitely indicates that this filter should be phase linear, and the examination of the vector diagrams of Fig. 3 would lead one to think that this filter should not attenuate the various sidebands encountered in FM and therefore have a flat top over at least twice the deviation, or 150 kc. The requirement for selectivity or suppression of signals outside the desired channel would indicate steep side slopes. This describes a filter which engineers and physicists have talked about for many a year, but have never constructed, the ideal filter shown in (A) of Fig. 5.

This kind of filter has a perfectly flat top in its passband, infinite attenuation outside of it, and perfectly linear phase shift.

An ideal filter can be approximated by the flat top filter shown in (B) of Fig. 5, and such filters are used in AM and in communications with great success. However, for linear-phase operation, additional phase-equalizing sections of a complexity similar to the filter itself have to be used. The result is shown in (C) if Fig. 5. This filter is sufficiently close in characteristics to an ideal filter to satisfy a mathematical analysis.

The FM signal passing through such a filter will pass only the carrier and the sidebands within the passband of the filter. An examination of the vector diagrams of Fig. 5 shows that elimination of the higher order sidebands will produce harmonic distortion similar to that caused by non-linear phase shift. The mathematics of this analysis are rather complicated, but fortunately it has been carried out by engineers of the Zenith Radio Corporation in their comments on FCC Docket 13506. Their results shown in mathematical symbols only, are replotted in Fig. 6 with actual values of modulating frequency, deviation, and filter bandwidth. From this, it can be seen that a filter 25 per cent wider than peak-to-peak deviation will produce adequate results for monophonic FM operation if about 2 per cent harmonic distortion before de-emphasis is considered tolerable at 15 kc. This maximum distortion would be reduced to about 0.7 per cent due to attenuation of the harmonies by the de-emphasis network.

For stereophonic FM reception, such a filter is definitely inadequate because of the high distortion created in the stereophonic subcarrier range from 23 to 53 kc. Even a considerable increase in filter bandwidth will not reduce distortion substantially. Clearly, a different kind of filter is required for the proper combination of low distortion and high selectivity—a compromise filter.

From this discussion we see that the amount of high-frequency distortion, particularly the distortion of the FM-stereo subchannel and its effect on high-frequency stereo separation, is the third most important specification for FM tuners, particularly when coupled with high selectivity. Unfortunately, because of a lack of standards covering FM-stereo measurements, this specification is usually not given. However, in standard separation measurements the ratio between left and right tuner outputs is given for single-channel signals. If separation is maintained at a minimum of 30 db over all audio frequencies between 50 cps and 15 kc, then distortion cannot be higher than about 3 per cent. Under these conditions, all other factors which can contribute to lack of separation must be close to zero. Since they are likely not to be, distortion therefore must be lower if separation is maintained at all audio frequencies.

Having established the need for i.f.-filter characteristics different from the "ideal" flat top filter, what kind should it be and how will it affect all the other tuner characteristics? As to "what," there seems to be a fair amount of agreement: First, the filter should be as phase linear as practical; second, it should be symmetrical; third, it should have only one peak (at the i.f. center frequency) and not two or more; fourth, toward the edges of the passband it should have progressively increasing attenuation and the attenuation slope should increase at frequencies farther removed from the i.f. center frequency; fifth, the bandwidth of this filter has to be wider for stereophonic operation than for monophonic operation.

In practice and in theory there is no ideal filter. Various filters have been proposed based on a variety of mathematical models such as cosine, hyperbolic cosine, Bode, and Gaussian. Typically, they have the passband characteristics shown in Fig. 7 with individual variations.
Class D Amplifiers

GEORGE FLETCHER COOPER

A closer look

IN TWO PARTS—PART 2

In Fig. 11 we have the classical picture of a transistor being switched on and off at the base. The collector current takes a finite time to rise, and when the base voltage is reversed the collector current remains fairly constant for the storage time and then falls smoothly. For a cheap power transistor these times are in the range of 10–40 microsecond, while for a computer transistor, if you have that sort of money, the times are around 1 microsecond. During this period we may say that the transistor is somewhere in the high dissipation region, passing some current and maintaining some voltage. If the peak current is \( I_c \) and the voltage supply is \( V_c \), the worst point is at \( (I_c/2)(V_c/2) \), or \( V_cI_c/4 \), although many circuits can, in fact, make matters even worse than this. Even so, this transition loss may be rather high. If we make \( V_c = 10 \) v. and \( I_c = 10 \) A, we get a product of 25. Now the high loss period will occur 100,000 times per second if we have 50 kcf switching, and even a 1-microsecond duration will give 2.5-watts loss, or just equal to the bottoming dissipation.

A look again at Fig. 11 will remind you that it is the turn-off which is the real problem. During the turn-on we meet a rather different problem, the very low input impedance at the base caused by the absence of any negative feedback effect in the emitter resistance until the collector current starts to flow. This must be dealt with by using a very low impedance source which can give a high initial current drive. To sweep out the stored charge in the base at turn-off we must reverse the base-emitter diode, and Mr. Birt recommends the use of a carbed pulse of the form shown in Fig. 12.

A way of avoiding this difficulty is to use a regenerative output stage. Any of the classic square-wave inverter circuits may be used here. I shall follow Mr. Birt in showing the circuit of Fig. 13. Left to itself this circuit will oscillate at a very low frequency determined by the saturation of the transformer primary, which makes the feedback effect collapse due to the reduction in load impedance. Roughly speaking this means that the transformer is an ordinary audio transformer suitable for the transistor used. Before this can happen, however, a pulse is applied to the an transistor at one of the two trigger points 1 and 2. As the transistor starts to cut off, the movement of the collector drives the other transistor on, thus bringing its collector down and increasing the cut-off drive to the first transistor. I have added speed-up capacitors across the feedback resistors to give compensation for the frequency limitation of the transistors.

As in inverter design, separate windings for the base feedback may be desirable in order to get rid of the steady bias from the collector supply and also to reduce the power absorbed in the feedback resistors. In a normal inverter circuit this can lead to a slowing-down of the switching operation, because there is some leakage inductance between the collector winding and the base winding. A trick which is useful here is to connect the speed-up capacitors from collectors to bases, instead of across the feedback resistor.

A regenerative output stage needs to be flicked from one side to the other and a suitable waveform for producing this action is obtained if we differentiate the length-modulated pulses. The result is a double train of very short pulses, as shown in Fig. 11. The regular upper train is applied to one of the transistors, the lower position-modulated train is inverted and applied to the other transistor. We may use an RL-differentiator, having a small inductance so that \( dL/dt \), in the circuit of Fig. 15, and then we can get the pulse inversion by using a center-tapped secondary. The diodes select only one sense of pulse. Birt suggests that these p.p.m. pulses are easier to handle than the length-modulated pulses, and thus by implication that they should be produced at the earliest possible stage in the system. His reasoning is, however, false, for there is an audio component even with position-modulated pulses. Nevertheless, a transistor amplifying this kind of pulse will need to dissipate relatively little energy: or will it? We have decreased the average current but we have doubled the number of transitions.

A conventional output stage, fed with the length-modulated pulses, might seem to raise few problems. It certainly seems to me to be the right way to start off your experiments, because it needs far fewer circuits. There are, in fact, some awkward details. Suppose that we use a normal low-pass filter to keep the 50 kc out of the loudspeaker. The stage is extremely efficient and so we must take power from the supply at an audio frequency.

(Continued on page 74)
Knobs: The Shame of it All

DON NORT

The serious business of equipment evaluation often leaves itself open to errors—either of commission or of omission. Herein we endeavor to correct one of the latter and at the same time to cover an important subject which has heretofore been sadly neglected.

We hesitate to mention, even in passing, the current cause celebre in magazine publishing. Though we have opinions—and strong ones—about the freedoms and responsibilities of the press, we see our role in the present controversy as that of an interested spectator. We refer, as you surely must know, to the seizure of the August Consumer Militant magazine by the Post Office Department.

Now whether or not Consumer Militant's comparative rating of stag films (plus a five-page foldout of the "good parts") falls within the legal definition of pornography is for the courts to decide. For the article itself—for the tested merits of "Snowbound in a Cabin" over "Miss Jackboots Night School," we couldn't care less.

But we were disturbed by the at least temporary loss of another article in CM's ill-fated August number—the report, "Sham and Shame: An Impartial Look at High-Fidelity Control Knobs." CM's 3800 subscribers will remember that the knob report was promised for imminent completion in the winter of 1965. Needless to say it has been eagerly awaited by their patient readers. It was eventually completed, but only in time to reach print this month in the confiscated issue. Such are the misfortunes of publishing.

Our own readers know that we have, at times, expressed some skepticism regarding comparative testing, particularly in regard to its beauty-contest aspect. Well, we may have been critical, but we do feel that the buying public is entitled to every available bit of information from every available source. And the knob article, if nothing else from the August CM, is available. A few weeks ago, we met with Consumer Militant's Harvey L. Greenwillow (B.A., M.S., Ph.D., past president of the Mt. Oasa MG Club), and with him arranged for the publication, in our own pages, of the knob article. Here then is Consumer Militant's long-awaited report on high-fidelity control knobs...

Sham and Shame: An Impartial Look at High-Fidelity Control Knobs

... some models are good, some bad ... some are better than others, some not ...

Since the last years of the McKinley

Fig. 1 Diagram showing the torque-amplifying characteristics of a properly chosen knob.

Administration, the American consumer has been faced with a bewildering proliferation of knobs. Knobs abound. Can anything be done to stem the swelling tide? At what point should the government step in? And what is the role of the informed consumer? CM wonders.

Knobs, Knobs, Knobs

In gentler times, the consumer needed few knobs. He used few. He bought few. But, as CM's consultants have repeatedly advised, times have changed.

Good and Bad

CM hastens to point out that it's positively no good to generalize about knobs: among knobs, as anything else, there are good and bad. But the choice before the consumer is quite clear—he must choose the good and/or avoid the bad. CM feels it cannot stress this last point too strongly.

Knobs For Hi-Fi

Knobs play a singularly important role in the use of high-fidelity components. In CM's opinion, a well-designed high-fidelity knob serves a two-fold purpose: (1) it amplifies (or "increases") the torque (or "twisting force") applied to the control shaft (Fig. 1); and (2) it also provides a convenient method of placing an indicator of the control shaft's position close to the panel lettering (Fig. 2).

Original Equipment Knobs: The Overview

CM's readers may wonder about the knobs so often included in the list prices of new components. Are these knobs adequate? In our view, they are not.

Original Equipment Knobs: Specifics

When CM tested control-amplifiers a few months ago, it made an appalling discovery. In case after case original equipment knobs could be detached inadvertently from their shafts—all the unwary user needed to do was pull instead of turn. More shocking was CM's discovery that in no case did the amplifier's operating instructions caution against pulling. Neither did the panel markings of any amplifier indicate that the knobs were to be turned, not pulled!

Worst of all, to CM's mind, were the manufacturers' refusals to "replace or repair" such palpably defective equipment. But that is a separate issue. (CM has placed its files in the hands of the appropriate regulatory agencies.)

A Ray of Hope

CM found that a very few amplifiers came equipped with knobs that could not be pulled off. We were, at first, elated.

The Light That Failed

But our joy was short-lived. One of our researchers discovered a tiny set-screw cunningly half-hidden in each of the knobs that had, at first, tested well. Our suspicions were aroused. We investigated and found that if these screws were in any way loosened, the knobs then pulled free with frightening ease!

A Good Knob is Hard to Find

Can nothing be done then? Must the consumer, who has already bought one of CM's Provisionally OK tuners or amplifiers be reconciled to wrapping yards of friction tape around his control shafts? CM says no.

(Continued on page 76)
Worrying the average audiophan—not to mention the industry at large—is the proposal that the Federal Trade Commission establish a definition of high fidelity. This IHF proposal may provide a satisfactory solution for everyone.

The Definition Hassle

C. G. McProud

WHEN IT WAS FIRST PROPOSED that the Federal Trade Commission should establish a binding definition of high fidelity in order to "protect" the buying public, there was considerable consternation in the ranks of component manufacturers and quite a bit of distress in the minds of the serious, dedicated audiophiles. Since even the high fidelity component industry within itself has never been able to provide a valid definition of what actually constituted "high fidelity," how could a non-technical government agency do so?

In order to satisfy the mass producers of "hi-fi" phonographs and radios, any such definition would necessarily have to be set so low down in the scale that almost anything above the quality level of the usual 6-transistor pocket radio set would begin to appear.

A committee formed by the Electronic Industries Association actually came up with a definition—one in which distortion, hum and noise, and rumble received no consideration. The resulting hue and cry from the component industry was not unexpected, and a number of other organizations were offered the opportunity of improving on the proposed definition. With little result. It would now appear that the hue and cry has abated somewhat, and—possibly on the assumption that if we say nothing about it, the whole matter will become lost in some dusty pigeonhole.

Criticism Not a Solution

Criticism of the whole idea of a government sponsored—and presumably enforced—definition is not the proper solution, even though it happens to be a popular indoor sport. What is really needed is some constructive action, and some steps have been taken in this direction already by Raymond V. Pepe, president of the IHF. His recommendation is that the "definition" be revamped so that instead of setting minimum performance standards, the manufacturer need only provide "on the label," so to speak, a statement of the specifications of the product if he wishes to call it "High Fidelity" or "Hi-Fi" at all. This, we think, is the deal solution.

There are similar parallels in other product industries. Throughout the food and candy industries, for example, it is obligatory that the manufacturer shall list the ingredients that go into the product. The consumer is no longer buying a "pig in a poke" when he goes to the store.

There are similar strict regulations about the labeling of whiskies, which are intended to inform the buyer as to what he is actually buying. Thus a "bottled in bond" whiskey must be at least four years old and of 100 proof. A "straight" whiskey must not contain any neutral spirits. A whiskey labeled "bourbon" must be made principally from corn, and so on. The rules and regulations governing the labeling of whiskey are elaborate and specific, and very well enforced. We can only hope that some similar and equally informative and intelligent result may come from this entire problem.

No one at all familiar with components is naive enough to believe that all of them are equally good. An amplifier, for example, with an output of 25 watts per channel, let us say, can be had for as little as $50 from one manufacturer, and for as much as $199.95 from another—a spread of four to one. No one actually believes that one is as good as the other, even though for some applications the less expensive unit may—and probably will—give completely satisfactory service. It is possible to buy a thoroughly nourishing and filling meal at one restaurant for a dollar or so, and at another for $20, but they may taste different.

Back to high fidelity again, we are all agreed that there are different degrees of performance, and that appearance and flexibility may also contribute to the appeal one product has over another. But to say that anything better than a specified minimum is "high-fidelity" can not help but be misleading to the consumer.

The Proposal

While it would be utopian if there could be a hard and fast dividing line between mediocre performance graphs and top performance component equipment, no such line exists—nor would we actually want one. But if it were mandatory that any product labeled "high fidelity" must have its right to such a designation supported by the manufacturer's statement in advertising and in the literature accompanying the product of the actual specifications of the product itself. And that is the fundamental idea behind Mr. Pepe's proposal.

It is not to be expected that a complete set of specifications would have to appear in labels or advertisements of any such product that the manufacturer might choose to call "high fidelity." In the first place, it would defeat its purpose because no one would read it through except the knowledgeable audiophan (and he probably wouldn't be shopping for a fringe product anyhow), and even if the layman were to read the specs he would not understand much about them. Nor do we think it likely that it would be possible, even if it were thought to be desirable, to get such a ruling across.

There are, however, a few simple specifications which would serve to give the consumer a yardstick by which he could compare products other than by the artistic and lexicographical proficiency of the manufacturer's ad agency. It would seem likely that sufficiently effective results could be had with as few as three required specifications for each type of product. For example, amplifiers could be quite well described by three "numbers"—power output, frequency bandwidth, and hum and noise level. Power output would be stated as "watts per channel at p per cent total harmonic distortion"; frequency bandwidth would be specified as the "limits of frequency at which response is 3 db down from the output at 1000 cps"; hum and noise should be specified as "d db below 1 watt." Similar, and equally simple required specifications can give the consumer some "numbers" by which he can compare the various products.

Even though the specs are somewhat technical and certainly unfamiliar to the layman, he would soon learn 20 watts per channel at 0.5 per cent distortion sounds as though it would be better than 12 watts per channel as 2 per cent distortion. It should not be hard to teach the consumer that a frequency bandwidth of 5 to 100,000 cps is better than one of 60 to 8000 cps, or that an amplifier with a hum and noise level of —30 db is better than one of —42.

Perhaps it would be possible to simplify the specs so as to get a Quality Factor in, say, seven digits—like a phone number. Suppose we divide the power output by the square of the distortion for the first two digits; for the bandwidth we subtract the lower figure from the upper and divide by 100; and for the third we simply use the number of db. Thus the better of the two amplifiers above would rate 80/999/80 and the poorer as 03/079/42.

Whatever the final solution, we do hope that it will give the hi-fi consumer some means of actually comparing performance, not claims. We couldn't ask for more than that.
PRODUCT PREVIEW SECTION

Presenting the annual compilation of the new—and some of the old standby—products that will be shown by your hi-fi dealer during the coming months, and at the New York High Fidelity Music Show in September.

When the Hi-Fi manufacturers bring forth their annual crop of new and improved products, they are understandably anxious that everyone should know all about them. We are in full sympathy with this desire to the extent that we employ the August issue as a Product Preview, and then—to continue the service—we make the entire section available later in a handy-sized book for continued reference. This book, to be published September 1, is known as the AudioGuide. In an attempt to arrive at some sort of uniformity in the descriptions of the products shown, each manufacturer was furnished forms for each category of products, with spaces for the information we think is important to the potential purchaser.

We have continued the style of preparation, allowing a listing of up to five items in addition to those principal ones, but without description in detail. Thus we have some 300 main listings plus an average of 2-plus subsidiary listings for each main one—giving us a total listing of almost 1000 products.

The specifications given are those provided by the manufacturer. Prices quoted may vary between East and West, but only one price is shown. In any instance, for further information about any product described or listed, just write to the manufacturer at the address given below—we will be glad to hear from you.

**ACOUSTECH**

- **Acoustats 1 Solid-State Stereo Power Amplifier.** A solid-state stereo power amplifier using silicon output transistors (after one megacase) combined with direct-coupled circuitry and output transformers provides excellent transient response. Milli-sec glass-epoxy boards, inside-
side electrolyt-
ics, and running-bonded transformer operation of all components. Exten-
sive warranty.

**Specifications:**
- Freq. resp. 2.5 to 25,000 cps ± 0.5 db at 5 watts output; power bandwidth, 25 to 10,000 cps per channel; harmonic distortion, 0.5%; 45 to 100,000 cps; 0.75%; 100,000 cps; 1.5%; sensitivity, 60 watts, 25 volts; damping factor, 25; direct-coupled; each output, 16 ohms; controls: on-off, input sensitivity; switches: volume, bass, treble, balance; source: AM, FM; price, $355. Acoustats, Inc.

**ALTEC**

- **511H Solid-State Power Amplifier.** The 511H is an all transistor amplifier which is adaptable to a wide variety of applications. Being of solid-state design it is ideal for re-

**Specifications:**
- Freq. resp. 20 to 20,000 cps ± 0.1 db at 10 watts output; power bandwidth, 50 to 15,000 cps; harmonic distortion, 0.15%; 90 watts from 20 to 10,000 cps; 1.0%; 100 watts from 20 to 5,000 cps; 0.5%; 90% of 200 watts; hum and noise, 50 db below 4800 cps; sensitivity, input for rated output, 2.5 volts; damping factor, 25; direct-coupled; each output, 16 ohms; controls: on-off, input sensitivity; switches: volume, bass, treble, balance; source: AM, FM; price, $649.00. Altec Lansing.

**DYNA**

- **Stereo 76A Stereo Power Amplifier.** Con-

**Specifications:**
- Freq. resp. 10 to 40,000 cps ± 0.5 db at 1 watt output; power output, rms, 50 watts per channel; harmonic distortion, 0.5%; 180 watts; 0.5% at 20 watts; 1.5% at 35 watts; 1% at 50 watts; 0.5% at 100 watts; 0.35% at 175 watts; 0.5% at 200 watts; hum and noise, 50 db below 35,000 cps; sensitivity, input for rated output, 2 volt; 2 volt output, 0.5% at 20 watts; 1% at 35 watts; 2% at 50 watts; 1% at 100 watts; 0.5% at 175 watts; 0.5% at 200 watts; controls: on-off, input sensitivity; switches: volume, source, stereo-mono; price, $117.00. Dynaco, Inc.

**FISHER**

- **SA-1600 150-Watt Stereo Power Amplifier.** The Fisher SA-1600, a 150-watt ultra-linear power amplifier, provides the same outstanding performance as the SA-3000, plus the additional capabilities in the input circuits. Each input stage is equipped with a new 417 cavity-anode beam power output tube to provide the best possible distortion throughout the audio spectrum. Excellent re-

**Specifications:**
- Freq. resp. 20 to 20,000 cps ± 0.5 db at 1 watt output; power output, rms, 30 watts per channel; harmonic distortion, 0.5% at 20 watts; 1% at 30 watts; 1% at 50 watts; 0.5% at 100 watts; 0.5% at 175 watts; 0.5% at 200 watts; hum and noise, 75 db below 70,000 cps; sensitivity, input for rated output, 2 volt; switch: on-off; level: 0 volt output, 1 volt; input impedances, 4, 8, 16, 3000 ohms; controls: on-off, input sensitivity; switches: volume, source, stereo-mono; price, $219.00. Evescor Corp.

**LEAK**

- **Stereo 60 Amplifier.** Engineered for top-

**Specifications:**
- Freq. resp. 20 to 20,000 cps ± 0.5 db at 1 watt output; power output, rms, 60 watts per channel; harmonic distortion, 0.5% at 20 watts; 1% at 30 watts; 1% at 50 watts; 0.5% at 100 watts; 0.5% at 175 watts; 0.5% at 200 watts; hum and noise, 50 db below 50,000 cps; sensitivity, input for rated output, 2 volt; switch: on-off; level: 0 volt output, 1 volt; input impedances, 4, 8, 16, 3000 ohms; controls: on-off, input sensitivity; switches: volume, source, stereo-mono; price, $315.00 (West). Leak Labs.
BASIC AMPLIFIER KITS

DYNKIT

- Stereo-55 Power-Amplifier Kit. A high-performance low-power amplifier with a circuit utilizing negative feedback. The output transformers are of a sulfurized organic-polyester nature, more expensive amplifiers. Easy to build, requiring only 3 hours, and requiring no instrument adjustments. Preassembled etched circuitry with printed assembly eliminating wiring errors. Compact, low profile design matches any preamps and tuners.

Specifications: Freq. resp. 20 to 20k cps 0.05 dB at 1 watt output; power bandwidth, 15 to 3500 cps; 115V music power output, 25 watts per channel; power output, rms, 75 watts per channel; harmonic distortion, 0.5% at 20 watts; 0.5% at 20k; 1% distortion, 0.5% at 55 watts; hum and noise, 60 db below 20-watt output; sensitivity, input for rated output, 1 volt; damping factor, 10; output impedances, 8, 16 ohms; weight, 18 lbs; dimensions, 13" wide, 4" high, 5½" deep; price $39.95. In stock.

1. Stereo 70, 35-watt rms each channel $99.95
2. Mark III, 60-watt rms mono amp... $79.95
3. Mark IV, 40-watt rms mono amp... $59.95

EICO

- HPA-12 Hi-Fi 100-watt Stereo Power Amplifier. High voltage is employed cathode-coupled push-pull circuits, preceded by a direct-connected voltage amplifier. Fixed-biased, push-pull EL34's are used in the output stage and provision is made for both bias and d-c balance adjustments. Silicon diode rectifiers provide very good regulation.

Specifications: Freq. resp. 5 to 100k cps 0.5 db at 2 watts output; power bandwidth, 15 to 1000000 cps; power output, 50 watts per channel; harmonic distortion 1.5% at 50 watts from 20 to 20k; 1% distortion, 0.5% at 20 k; hum and noise, 60.db below 20-watt output; sensitivity, input for rated output, 0.05 volts; damping factor, 10; output impedances, 8, 16, 4 ohms; controls, level set, bias, balance, bias voltage, level; functions, phase shift, d-c balance, switch function; meter, wattmeter, in/out, signal lights, 27 weight, 40 lbs; dimensions, 15½" wide, 6½" high, 11½" deep; price, $469.95. In stock.

1. HF-6TA 70-watt stereo amp kit... $74.95

FISHER

- K-1000 "Stratofish" 150 watt Stereo Power Amplifier. The K-1000 is the kit version of the RA-1000, and is in all respects the same. In addition to improved circuit design, the K-1000 is quickly and easily assembled, providing an opportunity for even the neophyte to achieve success retaining the quality inherent in the design. Since a professional level of meter is supplied, adjustments can be made by the user without need for other instruments.


HARMAN-KARDON

- Citation II 120-Watt Stereo Power Amplifier. Providing a peak power of 200 watts, the Citation II can reproduce frequencies as low as 20 Hz with reduced bass roll-off; frequencies as high as 150,000 cps with no evidence of instability or ringing. Features: video output provides wide response and low distortion; multiple feedback loops; power supply, silicon diode rectifiers, choke, heavy duty electronics and potentiometer terminal jacks and control cables to assure kit builder that his unit will be exactly duplicate of factory-built instrument.

Specifications: Freq. resp. 2 to 150,000 cps +0.1 db at 10 watts output; 200 watts power output, rms, 60 watts per channel; harmonic distortion, 20 watts, 0.6% at 20k; 0.2% at 1000; hum and noise, 90 db below 20-watt output; sensitivity, input for rated output, 0.15 volts; damping factor, 10; output impedances, 8, 16, 4 ohms; controls, bias, balance, power switches; weight, 45 lbs.; dimensions, 20" wide, 17½" deep; price, $1,095. In stock.

1. Citation V, 60-watt stereo power amplifer kit... $119.95

HEATHKIT

- 89-Watt Stereo Power Amplifier, Model A-127. This is a complete 89-watt stereo power amplifier, ready to use. The Heathkit A-127 is a complete 89-watt stereo power amplifier designed for high quality amplifier performance. The A-127 is powered by 89 watts and is designed for high quality amplifier performance. The A-127 is powered by 89 watts and is designed for high quality amplifier performance.

Specifications: Freq. resp. 4 to 60k cps ±0.05 db at 1 watt output; power bandwidth, 10 to 10k; 115V music power output, 40 watts per channel; power output, rms, 40 watts per channel; harmonic distortion, 1.5% at 40 watts from 20 to 20k; 0.5% at 20k; 0.5% at 50 watts; hum and noise, 45 db below 40-watt output; sensitivity, input for rated output, 0.15 volts; damping factor, 10; output impedances, 4, 8, 16, 8, 16, 4 ohms; controls, bias, balance, voltage level; functions, phase shift, d-c balance; meter, wattmeter, signal lights, 27 weight, 40 lbs; dimensions, 15½" wide, 7¾" high, 11½" deep; price, $79.95. Heath Co.

1. AA-111, 20-watt stereo power amp... $44.95

KNIGHT-KIT

- KR-95 75-Watt Stereo Basic Amplifier Kit. Extremely wide frequency response at full rated power and a large amount of reserve power. Premium-quality parts are used throughout, and utilizes printed circuit construction.

Specifications: Freq. resp. 15 to 30000 cps ±0.5 db at 70 watts output; power output, rms, 55 watts; harmonic distortion, 0.25% at 70 watts; 1% distortion, 0.15% at 70 watts; hum and noise, 90 db below rated output; sensitivity, input for rated output, 0.54 volts; output impedances, 4, 8, 16, 32 ohms; controls; (2) level, (3) balance, (4) power. Premium-Matic preamplifiers; monolithic power transistors, copperless, silver-plated, 2. weight, 59 lbs; dimensions, 15½" wide, 5½" high, 13½" deep; price, $309.00. Knight-Kit.

Specifications: Freq. resp. 14 to 45000 cps ±0.1 db at 50 watts output; power output, rms, 50 watts per channel; harmonic distortion, 1.5% at 50 watts from 20 to 20,000; 0.5% at 50 watts; hum and noise, 90 db below 50-watt output; sensitivity, input for rated output, 0.7 volts; damping factor, 15; output impedances, 4, 8, 16, 32 ohms; controls, bias, balance, power switches; weight, 75 lbs; dimensions, 16½" wide, 9" high, 11½" deep; price, $179.95. Metal enclosure, $7.95. Harman-Kardon, Inc.

1. Citation II 120-Watt Stereo Power Amplifier Kit... $119.95

LAFFAYETTE

- KT-110 190-Watt Stereo Amplifier Kit. A high-quality high-powered amplifier utilizing military construction techniques. The kit is easy to assemble and contains bias and balancing provisions.

Specifications: Freq. resp. 0.1 db at 10 watts output; power output, rms, 150 watts per channel; harmonic distortion, 1.5% at 15 watts from 20 to 20,000; 0.2% at 15 watts; hum and noise, 90 db below 15-watt output; sensitivity, input for rated output, 0.7 volts; damping factor, 15; output impedances, 4, 8, 16, 32 ohms; controls, bias, balance, power switches; weight, 180 lbs; dimensions, 17½" wide, 8½" high, 25½" deep. Price, $134.95. Lafayette Radio.

H. H. SCOTT

- LK-150 130-Watt Stereo Power Amplifier Kit. Matched 6550 output tubes, rated at 100 watts, are used in all critical amplification stages to assure long operating life. Switchable subcircuit filter permits the use of the LK-150 for laboratory applications where response below 5 cps is required. Input selectivity is switchable between 2.5 volts (for the LC-21 and other Scott preamplifiers) and 1.5 volts for preamplifiers with lower ratings.

Specifications: Freq. resp. 4 to 60k cps ±0.05 db at 10 watts output; power bandwidth, 10 to 20k; 115V music power output, 65 watts per channel; power output, rms, 60 watts per channel; harmonic distortion, 0.5% at 60 watts from 20 to 20k; 0.5% at 50 watts; 0.5% at 50 watts; hum and noise, 90 db below 50 watts; bias adjust with built-in meter; switches, output, input, ON-OFF. Weight, 18 lbs; dimensions, 18¼" wide, 6" high, 11½" deep; price, $179.95. Cover, $19.95. H. H. Scott, Inc.

PREAMPLIFIERS

ACOUSTECH

- Acoustech II Solid-State Stereo Control Center. High-quality performance and features are combined in a unit both easy to use and beautiful in appearance. A stepped decade level control which provides exact matching (within ¼ db) from 20 to 20k. A micro-level allows fine adjustment within 20 Hz. Matching switches are used to avoid sound changes below 20 db when changing records manually, assuring thieves, and so on. Appearance similar to Acoustech I.

Specifications: Inputs: Mag 1, Mag 2, Line Input 1, Hi Mag, Tuner, Tape 1, Tape 2, Speaker, 100 ohm; 15 max. Recording 100000000; 100 volts; 1.5 volts; freq. resp. 100000000 to 20,000, 20 volts; harmonic distortion, 0.2% at 20 watts; sensitivity, input for 1 watt output, 0.25 mV, 0.45 volts; hum and noise, 60 db below 20-watt output; Weight, 18 lbs; dimensions, 14¼" wide, 5½" high, 18½" deep. Price, $46.00, includes cove.

28 AUDIO • AUGUST, 1963

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when the British say
"the best pick-up arm in the world"
it warrants serious consideration

The English are noted for their conservatism and they especially are not given to extreme claims in advertising. Their statement that the SME is "the best pick-up arm in the world" is simply a fact. It is made by dedicated craftsmen working with extraordinarily close tolerances and standards—providing features unattainable in any other tone arm. Its "secret" (if it has one) is care in manufacture and testing, and utterly accurate adjustments for every critical factor in tracking. It is not inexpensive—perfection never is. It is, however, worth every penny to the audiophile who wants a pick-up arm capable of realizing the full potential of cartridge and record.

The Shure M33-5, of course. With the SME, provides absolute minimum tracking force... without distortion. Incredibly transparent sound. Peak-free high end, clean lows, astoundingly natural and clear in the middle range where most other cartridges suffer serious deficiencies. 22 x 10^-6 cm per dyne compliance. $36.50 net.
Dyna

● 406-CX Stereo Master Audio Control. The Fisher 406-CX is a high-quality preamplifier styled in the fashion of an audio control. It is equipped with 28 controls and 15 inputs. A stereo dimension control widens or narrows the apparent acoustic distance between stereo speakers. Included in the 406-CX are facilities for direct monitoring of stereo sound, without changing connections, separate high and low level input control, and provision for attaching remote control. A 2-speed indicator switch enables the listener to determine the input source.

Specifications: Inputs: special, low level, phone, tape head, FM-AM, monitor FM-MX, tape-1, tape head; controls: bass, treble, balance, volume, balance, blend, bass and treble on each channel; switches: power, filter, monitor, loudness compensation; output: main, 5k ohms, 2 max volts; recording 0.5 volts; freq. resp. 10 to 40k cps 0.5 db at 2 volts; harmonic distortion 0.25% at 2 volts; sensitivity, input for 1 volt output, phone, 2 mv, tuner, 0.1 volts; hum and noise, 74 db below 100mv input. Weight, 12 lb; dimensions, 13" wide, 4.5" high, 8" deep. Price, $199.95.

Fisher

● 207-1A Stereo Preamplifier. Specifications: Inputs: Mag, phone, tape head. FM-RX, FM-AM, TV, aux; controls: tone, bal, vol, sep. bass, sep. treble, switches: power, input sel., mode, equal., outputs: 4.1 line to tape rec., freq. resp. 5 to 100k cps 0.5 db at 2 volts; harmonic distortion, 0.25% at 2 volts from 2 to 30000 cps; 1M distortion, 0.25% at 15 volts; sensitivity, input for 2 volt output, phone, 1.5 mv, tuner, 0.25 volts; hum and noise, 35 db below 100mv output. Dimensions, 13" wide, 4" high, 8" deep. Price, $319.90.

Lafayette

● 11-600A Stereo Preamplifier. The 11-600A is a "no-compromise" preamp with twelve input jacks (six pairs) for program sources of any type or level.

Specifications: Inputs: mag, phone, ceramic, phone, tape head, tuner, aux; controls: rolloff, turnover, 2 pair bass and treble, bridge, switches: on-off, tape-monitor, maximum, minimum; filter, scratch filter, presence, loudness, function; output: 6000 ohms, 4 max. volts; recording 7.500 cfs; 2 volts; freq. resp. 3 to 40000 cfs 2 db; harmonic distortion, 0.1% at 2 volts from 30 to 15000 cfs; 1M distortion, 0.005% at 2 volts; linearity, input for 1 volt output, phone, 2.5 mv, tuner, 0.25 mv; hum and noise, 30 db below 2 volt output. Weight, 18 Ib; dimensions, 15% wide, 4.15/16" high. 11% deep. Price, $125.90.

Leak

● "Point One" Stereo Preamp. Decorator-design, the front panel offers changeable color turrets for both faceplate and knobs, enabling the user to match the color decor of any room. The escutcheon plate is interchangeable with the plate of older models, permitting owners the option of instantaneous conversion to the new styling. The "Point One" includes provisions for playing stereo, stereo reverse, left channel only, right channel only, and monophonically.

Specifications: Inputs: record, tape, mike, controls: bass, treble, balance, volume, volume, loudness, presence, cords: switches: function, Phasing, Tape Monitor, third-channel, controls: bass, treble, balance, volume, record, tape, mike; switches: function, (5 positions), input: record, resp. 20 to 20k cfs, 0.5 db at 2.5 volts; harmonic distortion, less than 0.05% at 2.5 volts at 4 kc; IM distortion, 0.1% at 2 volts; phasing correction, 2.5 mv, 0.25 volts; hum and noise, 60 db below 2.5 volt output. Weight, 18 lb; dimensions, 15% wide, 4.15/16" high. 11% deep. Price, $319.90.

Harmann-Kardon

● Citation I Stereo Control Center. Vacuum tube stereo preamplifier with extremely flat response to 80,000 cps and special feedback-loop circuitry. Results in low distortion and phase shift. Features: step-up transformer, stereo preamplifier, solid state silicon diode power supply for B and filament regulation; inputs and facilities for most stereo and monaural applications.

Specifications: Inputs: (4) Phono, (2) Tape, (2) Tape Mon. (2) Aux, (2) Tuner, (2) Tape Head; controls: bass, treble, balance, volume, loudness, Loudness, Presence; switches: volume, Phasing, Tape Monitor, third-channel, controls: bass, treble, balance, volume, record, tape, mike; switches: function, (5 positions), input: record, resp. 20 to 20k cfs, 0.5 db at 2.5 volts; harmonic distortion, 0.05% at 2 volts from 20 to 20k cfs; IM distortion, 0.05% at 2 volts; sensitivity, input for 1 volt output, phone, 0.5 mv, 0.25 volts; hum and noise, 85 db below 2.5 volt output. Weight, 32 lbs; dimensions, 14-1/4" wide, 6" high, 12-3/16" deep. Price, $345.00. Walnut enclosure, $225.00.

Marantz

● Model 7 Stereo Console. The Model 7 is a stereo control center with sufficient built-in flexibility to "grow with you" for a long time to come. In addition it is built to last that long, using the professional cabling and other construction techniques common to Marantz products.

Specifications: Inputs: mike, phone 1 and 2, tape head, FM-AM, FM-mux, TV, aux; controls: mode, selector, vol. balance, treble, bass switches: on-off, input, tone control, converter, tape monitor, record, equal.; outputs: main, center, sub-woofer, 15 in. deep. 1 volt output. phone 0.5 mv, 0.075 volts; hum and noise, 80 db below 15 mv input. Weight, 15 lbs; dimensions, 15% wide, 5 1/4" high, 7" deep. Price, $249.00. wooden cabinet, $24.00, Marantz Company.

McIntosh

● CT-4 Stereo Preamp. The latest in McIntosh stereo control preamplifiers featuring the new McIntosh chassis design and extended feedback methods.


Shure

● SE-1 Transtion Preamplifier. Designed especially for studio recording, broadcasting, mastering room playback, and related applications where the highest quality performance of disc reproduction is required. The Model SE-1 provides precise RIAA equalization from magnetic photo reproducers at linear levels. It features separate high- and low-frequency response trimmers on each channel and includes a flat position for calibration checks and special applications. Its performance meets the most critical standards with exceptional linearity, noise level, and susceptibility to stray r.f. fields.

Specifications: Inputs: 47,000 dbm phone input; controls: separate High and Low trimmers on each channel; switches: Hi-Fass, Low-Pass, Flat RIAA, on-off, output; main, 600 or 150 dbm; freq. resp. 30 to 10,000 cps; 1 db at 15 dbm; harmonic distortion, 1% at 15 dbm from 50 to 10,000 cps; hum and noise, 40 db below 15 dbm output. Preamplifier requires an output in long, 2.5" wide, 11" long, 7-1/16" high. Price, $339.95.

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**DECORATIVE** / with Bozaks in the wall and the electronics in a cupboard, your whole floor is free and an established decor remains as you planned it.

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For simplicity, for the ability to enlarge your music system ... above all, For The Grandeur of Great Music ... *build-in Bozaks!*
8 Tracks vs. 1/2 Track

Q. I am trying to make up my mind as to which one of several tape machines to purchase. I would most recommend a machine with half-track heads over one with quarter-track heads?

A. Not necessarily, at least not for home use. The principal reason for recommending quarter-track heads is that of a slightly reduced signal-to-noise ratio. Still, some quarter-track machines attain a ratio of 55 db, which is really excellent. Of course this isn't true of all quarter-track tape recorders; only of the best ones. Quarter-track heads have the advantage that azimuth alignment is less critical than for half-track heads. And of course they permit you to make a stereo recording in two directions of tape travel rather than one.

Converting to Low-Impedance Heads

Q. I would like some advice on converting from high- to low-impedance record heads. I have an old desk and desk preamp and desire to upgrade to 3-head operation providing monitoring through an additional preamp and incorporating a wide-gap record head. However, it seems that only low-impedance record-only heads are available. Can you provide a drive circuit for a low-impedance record head or suggest a source where such data can be found?

A. So far as supplying audio current to the record head is concerned, the only difference in the drive circuit would be the omission or reduction of the constant-current resistor. When the record head is high impedance, the constant-current resistor between the driving tube and the head typically has a value between about 22k and 47k. When the head is low impedance, the resistor is either omitted altogether (the plate resistance of the driving tube is sufficient) or reduced to a value as low as 5k. I would rather not attempt to provide a drive circuit inasmuch as record equalization is usually tied in with this stage. Accordingly, the circuit would vary with the equalization that is used.

I think that your chief problem in changing to a low-impedance record head is that of supplying the necessary amount of bias current. With this head you will need substantially more bias current, perhaps requiring a change in the oscillator design.

More Buying Guidelines

Q. I am planning to purchase a tape recorder in the very near future. My problem is whether the recorder I have chosen is a good choice. This is the ** tape machine. Its specifications are: frequency response 50-14,000 cps; signal-to-noise ratio 45 db; harmonic distortion less than 0.1 per cent; wow and flutter less than 0.3 per cent; speed accurate within 1 per cent; operates at 5 speeds, provides mono recording and stereo playback, has quarter-track heads, and has self-contained speakers.

At present I have a phonograph, amplifier, and tuner of medium quality. I have always wanted a tape recorder but the prices were too high until I discovered the ** machine. It has all the features I want and then some. I am now very confused as to what I should do.

A. I cannot venture an opinion as to the merits and demerits of specific brands of equipment, especially since I do not have full and continuing access to every tape recorder on the market. However, I can comment on the specifications that you have listed. All look good, except that a signal-to-noise ratio of 45 db is somewhat on the low side. A top-quality machine achieves a ratio of about 55 db. A ratio around 50 db is still good. But a ratio of 45 db is only fair.

You state that harmonic distortion is rated as more 0.1 per cent. I find this very hard to believe. The finest home machines produce about 3 per cent harmonic distortion at maximum permissible recording level, and they still produce in the region of 1 per cent distortion at "normal" recording levels. Accordingly, if the machine you are considering does indeed claim 0.1 per cent distortion, the other claims made by this machine are thrown into question.

Recorder Specifications

Q. In connection with the ** tape recorder that I plan to buy, I would appreciate your answers to the following questions:

1. The specifications state that the machine has three motors. Are all three of the hysteresis type?

2. Is the sound-on-sound button really what the name indicates, or is it a tricky imitation?

3. Where is the tape monitored, that is, at the head, at the input amplifier, or wherever?

A. I am unfamiliar with the machine you mention, which is made abroad. However, the following general information may be helpful to you.

Hysteresis-synchronous motors, which run at constant speed, are generally used only to drive the capstan. When additional motors are employed to drive the reels, they are usually induction motors, which operate at a variable speed, depending on applied voltage.

For accurate sound-on-sound recording it is necessary that one can do the following: (1) Monitor previously recorded material as it is played back; (2) record new material; (3) combine the old and new material on the same track. In the case of a mono tape recorder, this requires: (1) Separate record and playback tape amplifiers, permitting simultaneous record and playback; (2) the playback head (usually an extra one) be positioned before the erase and record heads, so that one can listen to the first material before it is erased; (3) the drive mechanism to control the upper gap for recording and the lower gap for playback (or vice versa). Whether the manufacturer has taken any of this possibility is another question. Assuming the same stereo head is used for recording and playback, the following must take place to permit true sound-on-sound: (1) As the first record material is played back on channel 1, this signal is fed into channel 2, where it is recorded; (2) one of the new materials can also be recorded on channel 2. As you can visualize, such a machine must have the flexibility of being able to play on one channel while recording on the other; and of being able to mix two signals while recording.

Possibly the sound-on-sound button in the tape recorder you mention does this. I don't know. I do know, however, that some tape machines only provide what you call a "tricky imitation" of sound-on-sound. When you push the button, all that happens is that the erase head is deactivated, permitting you to record the tape without erasing the prior recording. However, this does not permit you to listen simultaneously to the first recording so that you can synchronize the original material with the new material.

When a tape machine has separate record and playback heads, monitoring should take place at the final output in playback; you record and play simultaneously. Such a machine usually has an A-B switch so that you can compare the playback signal with the input signal. When a tape machine employs the same head for record and playback, monitoring takes place during the recording process, usually at a point prior to the record equalization circuit. This kind of monitoring tells you how much the signal is getting into the record amplifier. But you don't know what happens beyond that point until you listen to the tape playback at a later point of time.
You push the button down, the music goes round and round

and it comes out great!

CAPTURED BY CONCORD: SOUNDS FOR CONNOISSEURS

The magnificent Concord 880 (as do all professional tape recorders) has three separate heads—one record, one playback and one erase. To make professional quality stereo tape recordings from F.M. multiplex, stereo records, or live performances, your tape recorder must have three heads!

Operational conveniences include all push button controls, three speeds, two VU meters, and two professional full range dynamic microphones. The Concord 880 records 4-track mono or stereo, sound on sound, and sound with sound. Priced less than $400!

Other outstanding features: Trans-A-Track for sing-a-long or music and language instruction • Exclusive computerized channel indicator • 10 watt dual amplifiers • Separated full range 7” speakers for perfect stereo • Dual cathode follower outputs • Flutter-free salient pole drive motor • Built-in monitoring and P.A. facilities.

CONCORD 880

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Champagne Enterprises Ltd., Toronto

OTHER CONCORD MODELS

CONCORD 550—transistorized 4-track stereo record and playback, push button operation, three speeds, Trans-A-Track, sound-on-sound, dual amplifiers, two VU meters, separated 5” speakers for full stereo effect. Priced less than $320!

CONCORD 550D—tape deck version of transistorized Stereo 550. Priced less than $330!

CONCORD 220—Hi fi duality mono recorder, all push button, three speeds, varisync flutter-free drive motor, dynamic microphone, cue and edit button, magic eye record level indicator, plus Audio-Synctrol accessory for home movie sound. Priced less than $150 plus Audio-Synctrol attachment.

Prices slightly higher in Canada.
DYNAPLOR KITS

DYNAPLOR

- PAR-2 Stereo Preamplifier Kit. Low-cost, high-performance, highly flexible feedback design, full control of construction through simplified circuitry and the use of precision etched circuit boards. Average construction time six hours.

Specifications: Inputs: phone, tape head, FM-A/M special low level, FM-31X, SSSP (high level); controls: selector, volume, balance, bass, treble, phono, filter, monitor, loudness compensation; outputs: main, 5000 ohms, 0.1% voltage; recording, 0.5 volts; freq. resp., 10 to 40k cps ± 0.6% at 2 volts; harmonic distortion, 0.6% of 2 volts from 20 to 20k cps; crosstalk, < 0.8% at 2 volts; sensitivity, input for 1 volt output, phone 3.5 mv, tuner, 0.55 mv. $95.95, 14-300 deluxe panel mount kit, $135.95.

EICO

- ST 84 Stereo Preamplifier Kit. For all functions of the ST 84 all types of distortion are down to 0.04% at all levels. This is true not only at average input levels and when tone controls are set close to flat, but also at peak input levels and when tone controls are set at extreme positions.

Specifications: Inputs: mag ph 1, mag ph 2, tape, mic, tuner, (3) rtx; controls: level, balance, bass channel, bass channel 2, treble channel 1, treble channel 2; switches: input, monitor, tape, main, tape head, loudness, scratch filter, ruby filter, tape speed equals; outputs: main 8X output, 4X recording, 1000 ohms, 4 volt; freq. resp., 3 to 25k cps ± 0.5% at 2 volts; harmonic distortion, 0.2% of 2 volts from 20 to 20k cps; IM distortion, 0.4% at 2 volts; sensitivity, input for 1 volt output, phone 1.6 mv, tuner, 0.17 mv; hum and noise 70 db below 1 volt output. Weight 8.1 lbs; dimensions, 15 1/2" wide, 5 1/4" high, 8 3/4" deep. Price $95.95.

HARMAN-KARDON

- Citation A Solid State Stereo Control Center. The Citation A features response to 1 mc with unmeasurable distortion and excellent phase linearity; 7 stages of gain mounted on separate, slide-out glass epoxy module along with fully adjustable against extreme temperature variations; excellent square wave response with a time rise of less than one microsecond; stereo channel power output of 100 watts, 8 ohms completely wired and tested at the factory; separate volume and tone controls for each channel are electrically out of the circuit in the "flat" position.

Specifications: Inputs: Mag HI, Mag LO, Tape, Extra, Tuner, Mike; controls: Bass, Treble, Balance, Separate Bass and Treble, Center Channel; switches: Input Selector, Stereo Selector, Rumble, Scratch, Monitor, Loudness, Phase, Treble; outputs: main, 8X output, 30X, 5000 ohms, 10 max volts; recording, 0.5 volts; freq. resp., 10 to 50k cps ± 2.6 db at 2 volts; harmonic distortion, 0.1% at 2.5 volts from 20 to 20k cps; IM distortion, 0.4% at 2.5 volts; sensitivity, input for 1 volt output, phone 0.5 mv, tuner, 0.05 mv; hum and noise 70 db below 1 volt output. Weight 45 lbs; dimensions, 15 1/2" wide, 5 1/4" high, 11 3/4" deep. Price $312.00.

ALTEC

- 5664A Amplifier. All solid-state circuitry, self-biasing networks for all channel and a.c. line. Dual microphone inputs for stereo recording, 1800 volt peak channel and a.c. line. Dual microphone inputs for stereo recording, 1800 volt peak channel and a.c. line. Dual microphone inputs for stereo recording, 1800 volt peak channel and a.c. line. Dual microphone inputs for stereo recording, 1800 volt peak channel and a.c. line.

Specifications: Inputs: Phone, Tape Head, Microphone, FM, IF, FM-MIX, AM, rect.; controls: Volume, Bass, Treble, Balance, Bass channel, Treble channel, input level; switches: Selector, Stereo Selector, Balance, Treble, Rumble, Monitor, Lamp, Power Switch, Overcurrent Protection, Power On-Off Switch, Output Transformer, Frequency, Mode, Contour, Reverse, Hi & Lo Filters, Tape, Tann. Record, Tuner, Selector, Switch, Tann.; Outputs: Main, low, highs, 6X max volts; recording low, highs 2 volts; stereo headphones, 3 a.c. receptacles; freq. resp., 1 cps to 1 mc, 0.25 db at 2 volts; harmonic distortion, unmeasurable at 2 volts from 20 to 20k volts; 1M distortion, 0.05% at 2 volts; sensitivity, input for 1 volt output, phone 3.5 mv, tuner, 0.25 mv; hum and noise, 85 db below 2 volt output. Dimensions, 14 1/2" wide, 5 3/4" high, 7" deep. Price $250.00. (Assembled, $350.00.) Walnut enclosure $20.00. Harmann-Kardon, Inc.

HEATHKIT

- Stereo Preamplifier Model AA-11. Nine push buttons select basic functions on the front panel while secondary controls are out of sight behind fold-down panel.

Specifications: Inputs: Phone, Tape Head, FM, IF, AM, rect.; controls: Volume, Bass, Treble, Balance, Bass channel, Treble channel, input level; switches: Selector, Stereo Selector, Balance, Treble, Rumble, Monitor, Lamp, Power Switch, Overcurrent Protection, Power On-Off Switch, Output Transformer, Frequency, Mode, Contour, Reverse, Hi & Lo Filters, Tape, Tann. Record, Tuner, Selector, Switch, Tann.; Outputs: Main, low, highs, 6X max volts; recording low, highs 2 volts; stereo headphones, 3 a.c. receptacles; freq. resp., 1 cps to 1 mc, 0.25 db at 2 volts; harmonic distortion, unmeasurable at 2 volts from 20 to 20k volts; 1M distortion, 0.05% at 2 volts; sensitivity, input for 1 volt output, phone 3.5 mv, tuner, 0.25 mv; hum and noise, 85 db below 2 volt output. Dimensions, 14 1/2" wide, 5 3/4" high, 7" deep. Price $84.95. (Assembled, $102.00.)

BELL

- Model 214 4-way Stereo Amplifier. This compact unit offers all the features anyone normally expects in a high-quality amplifier, yet is available at a price that anyone can afford.

Specifications: Freq. resp., 20 to 20000 cps ± 1 db at 1 watt output; power bandwidth, 20 to 20000 cps; 1HF music power output, 22 watts per channel; power output, rms, 20 watts per channel; harmonic distortion 1% at 20 watts from 50 to 15000 cps; 1M distortion, 1% at 20 watts; hum and noise, 84 db below 1 watt output; sensitivity, input for rated output—phone, 3.5 mv, tuner, 0.25 mv; damping factor, 4; output impedance, 8, 16 ohms and high-Z for recorder; inputs—8, 12, tape head, 2 tape amp, 2 aux in; output—phone, weight, 18 lbs. Dimensions: 18 1/4" wide, 8 3/4" high, 14 1/2" deep. Bell Sound Division.
YOU SUPPLY THE FREQUENCIES... KODAK TAPE SUPPLIES THE RESPONSE

The timbre of a clarinet, or even a base viol, depends on high-frequency overtones for distinctive character. All these overtones are captured accurately on KODAK Sound Recording Tape. The reason? The oxide layer of KODAK Sound Recording Tape is formulated and applied with the same degree of precision as a Kodak film emulsion. That's just one reason why each and every roll of Kodak tape reproduces exactly what it hears.

And there's a convenience bonus! The 7-inch KODAK Thread-Easy Reel loads fast—you simply pull the tape through a slot. There's also a handy indexing scale and a tape splicer jig on each reel.

Enjoy the faithful response of KODAK Sound Recording Tape this week. It's sold by your Kodak dealer.

EASTMAN KODAK COMPANY, ROCHESTER 4, N.Y.

AUDIO • AUGUST, 1963
HARMAN-KARDON

- Model A-100GT Solid-State 70-Watt Integrated Stereo Amplifier. Solid-state circuitry throughout elim- inates tube noise and audio trans- formers. Features: response well beyond the range of hearing; 70 watts of power, low dis- tortion, assured by the use of industrial grade, fast-switching silicon semiconductors and carefully regulated power supply; virtually no hum or microphonic; military-type, binged glass maze boards for ruggedness and easy accessibility.

FISHER

- Model X-2021 80Watt Master Control Amplifier. The Fisher X-2021 is a high-quality master control amplifier, providing versatile input and control facilities, as well as an 80-watt dual-channel power amplifier. Eighteen inputs and ten outputs accommodate every type of program source and recording instrument. Twenty controls make possible virtually complete control of sound by the listener. A power-derived channel output is fur- nished, providing three-speaker stereo with- out the need for an additional power amplifier. A front panel jack is provided for private listening with earphones, while the speakers are disabled.

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MORE CLEAN, UNDISTORTED POWER, BANDWIDTH AND FEATURES THAN FAR COSTLIER INTEGRATED VACUUM TUBE STEREOPHONIC AMPLIFIERS  
THE NEW AWARD A700

Let's consider the qualities that really make the difference in performance. Not "gingerbread."

The new Award A700 puts out a big, clean 70 watts of audio power. That's more than enough to drive any speaker—regardless of efficiency. No matter what speaker you use, chances are the A700 will be coasting most of the time.

Now consider the frequency response of the A700—12 – 70,000 cps ± 1 db! No other integrated vacuum tube amplifier—regardless of price—can approach it! What makes the difference? The A700's solid state power supply, plus its specially designed grain-oriented steel output transformers!

The A700's bandwidth superiority can be demonstrated visually with test instruments. More important, it can be heard in your living room! It is this extended bandwidth—octaves above and below the normal range of hearing—that assures flawless reproduction within the audible range...

and at all power levels!

Run through the gamut of conventional controls on any fine integrated stereo amplifier—individual bass and treble tone controls, tape monitor switch, separate high and low cut filters, balance control, contour control, blend control—you name it, the A700 has them all and more!

But where the A700 really moves "out front" is where it counts—performance! For final proof, ask your dealer to demonstrate the A700 against other costlier amplifiers. Even against some of the so-called "world's-best. For anyone with highly critical standards—and a modest budget—the A700 is the only logical choice. Write Harman-Kardon, Dept. A-8, Plainview, N. Y., for more information on this superb integrated stereo amplifier.

The A700—$179.95. Prices slightly higher in the West.

Harman Kardon, a subsidiary of The Jerrold Corporation
SHERWOOD

- S-1050H 75-Watt Amplifier and Preamp
  - Features: Preamp; arching anodized aluminum; factory milled and precision bored tubes; subzero-cryogenic treated transformers; phase-invert switch; tape-monitor switch; comes with a 2-year warranty.

FISHER

- RX-1000 Stereo-Transistor 30-Watt Stereo Master Control Amplifier
  - Specifications: Freq. resp. 20 to 20,000 cps ± 0.5 db at 76 watts output; HIIF music output, 40 watts per channel; power output, rms, 25 watts per channel; harmonic distortion, 0.25% at 20 watts; channel separation, 90 db per channel; input impedance, 20 k-ohms.
  - Price: $134.95, Heath Co.

- RX-959 Transistor Amplifier Kit
  - Specifications: Freq. resp. 20 to 20,000 cps ± 0.5 db at 37 watts output; HIIF music power output, 60 watts per channel; power output, rms, 25 watts per channel; harmonic distortion, 0.5% at 25 watts; channel separation, 75 db per channel; output impedances, 4, 8, 16 ohms; input impedances, 4, 8, 16 ohms; power input, 0.25 watts.
  - Price: $119.95, Heath Co.

KNIGHT-KIT

- KT-599 Transistor Amplifier Kit
  - Specifications: Freq. resp. 20 to 20,000 cps ± 0.5 db at 37 watts output; HIIF music power output, 60 watts per channel; power output, rms, 25 watts per channel; harmonic distortion, 0.5% at 25 watts; channel separation, 75 db per channel; output impedances, 4, 8, 16 ohms; input impedances, 4, 8, 16 ohms; power input, 0.25 watts.
  - Price: $119.95, Heath Co.

INTEGRATED AMPLIFIER KITS

DYNAKIT

- KT-31-40 5-Watt Stereo Control Amplifier
  - Specifications: Freq. resp. 20 to 20,000 cps ± 0.5 db at 5 watts output; HIIF music output, 40 watts per channel; power output, rms, 25 watts per channel; harmonic distortion, 0.25% at 20 watts; channel separation, 90 db per channel; input impedance, 20 k-ohms.
  - Price: $134.95, Heath Co.

HARMON-KARDON

- Model A50K 56-Watt Integrated Stereo Amplifier Kit
  - Specifications: Freq. resp. 20 to 20,000 cps ± 1 db at 70 watts output; power bandwidth, 13 watts per channel; power output, rms, 20 watts per channel; harmonic distortion, 0.5% at 20 watts; channel separation, 75 db per channel; input impedance, 20 k-ohms.
  - Price: $129.95, Heath Co.

EICO CLASSIC SERIES

- 325K 35-Watt Stereo Amplifier Kit
  - Specifications: Freq. resp. 20 to 20,000 cps ± 1 db at 70 watts output; power bandwidth, 13 watts per channel; power output, rms, 20 watts per channel; harmonic distortion, 0.5% at 20 watts; channel separation, 75 db per channel; input impedance, 20 k-ohms.
  - Price: $129.95, Heath Co.

HEATHKIT

- 30-Watt Transistor Stereo Amplifier Model 41-21
  - Specifications: Freq. resp. 20 to 20,000 cps ± 1 db at 5 watts output; power bandwidth, 13 watts per channel; power output, rms, 20 watts per channel; harmonic distortion, 0.5% at 20 watts; channel separation, 75 db per channel; input impedance, 20 k-ohms.
  - Price: $129.95, Heath Co.

-Pacific Radio

- Model KT-260AWX, 50-Watt stereo amp...
  - Price: $74.95

- Model KT-263AWX, 60-Watt stereo amp...
  - Price: $99.95

LAFAYETTE

- KT-599 Transistor Amplifier Kit
  - Specifications: Freq. resp. 20 to 20,000 cps ± 0.5 db at 37 watts output; HIIF music power output, 60 watts per channel; power output, rms, 25 watts per channel; harmonic distortion, 0.5% at 25 watts; channel separation, 75 db per channel; output impedances, 4, 8, 16 ohms; input impedances, 4, 8, 16 ohms; power input, 0.25 watts.
  - Price: $119.95, Lafayette Radio.

PACO

- Model S-4-50 Integrated Amplifier
  - Specifications: Freq. resp. 20 to 20,000 cps ± 0.5 db at 37 watts output; HIIF music power output, 60 watts per channel; power output, rms, 25 watts per channel; harmonic distortion, 0.5% at 25 watts; channel separation, 75 db per channel; input impedance, 20 k-ohms.
  - Price: $129.95, Lafayette Radio.

- Model S-4-50 Integrated Amplifier
  - Specifications: Freq. resp. 20 to 20,000 cps ± 0.5 db at 37 watts output; HIIF music power output, 60 watts per channel; power output, rms, 25 watts per channel; harmonic distortion, 0.5% at 25 watts; channel separation, 75 db per channel; input impedance, 20 k-ohms.
  - Price: $129.95, Lafayette Radio.

- Model S-4-50 Integrated Amplifier
  - Specifications: Freq. resp. 20 to 20,000 cps ± 0.5 db at 37 watts output; HIIF music power output, 60 watts per channel; power output, rms, 25 watts per channel; harmonic distortion, 0.5% at 25 watts; channel separation, 75 db per channel; input impedance, 20 k-ohms.
  - Price: $129.95, Lafayette Radio.
All six speakers incorporate certain recent refinements which have made possible the task of creating the W90 system. A brief description will clarify what we mean:

The Cone Surround is an exclusive rolled-rim design, the largest and most effective form of the traditional Wharfedale soft suspension. Earlier surrounds (porous foam or cloth) provided such superior bass damping that they became renowned as an outstanding physical characteristic of Wharfedale speakers. Now, more than ever before, the Wharfedale cone is capable of the long excursions required for true bass energy in a sophisticated tuned duct enclosure. The cone material is special—compounded of long fibred wool (traditional to the North of England home of these speakers) and soft pulp. It achieves superior results from the start and its natural resilience endures continuous perfection over the years.

The Magnets are truly impressive, individually and totally. Because of its massive size and the special design of the magnetic gap, each provides higher total flux in the gap field than has been true of the magnets in any prior speaker system. The six magnets together make the W90 a "high efficiency" speaker, achieving maximum performance at low amplifier power. All-too-many popular speaker systems are starved for power, depending upon exaggerated amounts of amplifier wattage. In the W90, therefore, the all-important transient bass response is excellent, even at low volume. This clear, low end, at reasonable listening levels, is a major reason why all Wharfedales are so pleasant to "live with."

With its six speakers, the W90 is actually a dual 3-way system with all units designed for each other and crossover settings calibrated for undistorted response throughout the audio spectrum. The support effect of the tandem speaker systems results in a sound of exceptional authority, yet in balance over the entire range.

LOW RANGE. Two 12¼" low frequency drivers handle the sound from 20 to 1,500 cycles. The listener can expect to enjoy the true, fundamental bass notes, so often masked. The two drivers total a cone area of 94 square inches. Thus the W90 tandem idea yields the same result as a single low frequency driver of such massive size and weight as to be impractical in the home.

MID-RANGE. Two 5¼" mid-range speakers cover the relatively narrow but vital band of 1,500 to 6,000 cycles. The listener will be startled, for example, by the clarity of the baritone voice and the exceptional resolution of most solo instruments, permitted to stand in correct perspective. The handling of this "fill" range in the W90 is the recognizable key to its satisfying full-throated sound.

TREBLE. Two 3" treble speakers are the well-established Super 3's, much admired for their ability to present the clear treble without strain. With them they are eminently listenable, unusual for tweeters. This is no accident. It is the result of cone-type design rather than horn-type construction, and refinements such as low-mass aluminum voice coils ultrasonically tinned, powered by magnets so large that they are seldom found even in speakers four times the diameter.

Wharfedale • Division of British Industries Corp., Port Washington, N.Y.
Specifications: Freq. resp. 20 to 20k cps ± 1 db; power output: 20 watts; power bandwidth: 55 to 16k; 0.9% harmonic distortion at 12 watts; hum and noise: 0.9% at 12 watts; sensitivity: 1.25 volts/mW; input/2; 2 tape am, 2 mic, Monitor: weight: 20 lbs. Dimensions: 15% wide, 5% high, 13% deep. Price: $89.55. Cases in various woods and metals from $13.55.

3. FM-500 Automatic Tuner. The MF-500 automatically stops the tuner at the point of maximum fidelity. "Stereo Beam® automatically indicates the presence of stereo broadcasts. The tuner automatically switches between stereo and monaural modes of operation. A time delay reduces noise on stereo programs from weak stations. Remote control on headphones, volume, and power off-on.

Specifications: 16 tubes, cascaded front end. 4 i.f. stages: balanced bridge detector, 2 stereo channels; 9 cathode-ray indicator; output signal 2 volts; 2 outputs: controls—tuning, volume; 7 output circuits: 60 db; harmonic distortion 0.5%; I.F. load 50 ohms. Price: $399.50. Dynaco, Inc.

BELL

Specifications: 12 tubes; cascade front end: kraft, bar tuning indicator: controls—tuning, switching, volume, stereo select, noise filter, stereo-mono; freq. resp. +1 db from 20 to 20,000, 0.9% harmonic distortion 1.25 volts/20, 25 db filtering with 300-ohm antenna; stereo select 5000; FM-500 stereo select 5000; audio stages: 15% wide, 5% high, 11% deep. Weight: 13 lbs. Price: $250.00.

FISHER

Specifications: 16 tubes, cascaded front end: 5 i.f. stages: ratio detector: 1 audio meter; bar tuning indicator; output signal 1.5 volts; 3 outputs: controls—AM tuning, FM tuning: switch-off, off, a.f.c. select, freq. resp. ±2 db from 20 to 50k; 0.9% harmonic distortion 55 db; 2 output circuits: 60 db; harmonic distortion: 0.5%; I.F. load 50 ohms. Price: $250.00. Dynaco, Inc.

Specifications: 13 tubes, cascaded front end: 4 i.f. stages: balanced bridge detector, 2 stereo channels; 9 cathode-ray indicator; output signal 2 volts; 2 outputs: controls—tuning, volume; 7 output circuits: 60 db; harmonic distortion 0.5%; I.F. load 50 ohms. Price: $399.50. Dynaco, Inc.

Specifications: FM-900 Remote Control FM Stereo Tuner. The Fisher MF-300 combines the ease of remote control with excellent performance characteristics. The MF-300 automatically stops the tuner at the point of maximum fidelity. "Stereo Beam® automatically indicates the presence of stereo broadcasts. The tuner automatically switches between stereo and monaural modes of operation. A time delay reduces noise on stereo programs from weak stations. Remote control on headphones, volume, and power off-on.

Specifications: 16 tubes, 24 diodes, cascaded front end: 5 i.f. stages: ratio detector: 4 audio stages; "Stereo Beam® tuning indicator; output signal 2.5 volts; 4 outputs: controls—manual and automatic tuning; switch—stereo filter, mode selector, muting, automatic channel memory, automatic power on-off. Price: $399.50. Dynaco, Inc.

Specifications: FM-500 Automatic Tuner. The MF-500 automatically stops the tuner at the point of maximum fidelity. "Stereo Beam® automatically indicates the presence of stereo broadcasts. The tuner automatically switches between stereo and monaural modes of operation. A time delay reduces noise on stereo programs from weak stations. Remote control on headphones, volume, and power off-on.

Specifications: 16 tubes, 24 diodes, cascaded front end: 5 i.f. stages: ratio detector: 4 audio stages; "Stereo Beam® tuning indicator; output signal 2.5 volts; 4 outputs: controls—manual and automatic tuning; switch—stereo filter, mode selector, muting, automatic channel memory, automatic power on-off. Price: $399.50. Dynaco, Inc.
# Buyer’s Guide and Condensed Applications Chart—Norelco ‘Continental’ Tape Recorders

This condensed guide, prepared by the High Fidelity Products Division of North American Philips Company, Inc., offers the consumer the factual data he needs to select the tape recorder best suited to his specific requirements.

<table>
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<tr>
<th>PRIMARY USERS</th>
<th>Continental ‘100’ Model EL 3585</th>
<th>Continental ‘200’ Model EL 3541</th>
<th>Continental ‘300’ Model EL 3542</th>
<th>Continental ‘301’ Model EL 3549</th>
<th>Continental ‘401’ Model EL 3534</th>
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</thead>
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<tr>
<td>The entire family—at work, at play, at home or away.</td>
<td>Serious music lovers with limited budgets.</td>
<td>Schools, churches, teachers of voice and music. Psychiatrists, speech therapists and recreation directors.</td>
<td>Collectors of pre-recorded stereo tapes and those who record extremely lengthy program material, in addition to those listed for the Continental ‘300’.</td>
<td>Professional musicians, studio recordists, serious music lovers, high fidelity enthusiasts, doctors, dentists, industrial sound installation contractors.</td>
<td>Professional-quality stereo recording, live or broadcast, space-saving hi-fi system control center and background music.</td>
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<table>
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<tr>
<th>RECORDING CAPABILITIES</th>
<th>Monophonic 2-Track</th>
<th>Monophonic 4-Track</th>
<th>Monophonic 4-Track</th>
<th>Monophonic 4-Track</th>
<th>Stereo and Mono 4-Track</th>
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<tr>
<td>PLAYBACK CAPABILITIES</td>
<td>Monophonic 2-Track</td>
<td>Stereo and Mono 4-Track</td>
<td>Stereo and Mono 4-Track</td>
<td>Stereo and Mono 4-Track</td>
<td>Stereo and Mono 4-Track</td>
</tr>
<tr>
<td>SPEEDS</td>
<td>1 3/4 ips</td>
<td>1 3/4 ips</td>
<td>1 3/4 ips</td>
<td>1 3/4 ips</td>
<td>1 3/4 ips</td>
</tr>
<tr>
<td>PLAYING TIME PER REEL</td>
<td>Up to 2 hrs. on a 4&quot; reel</td>
<td>Up to 4 hrs. on a 7&quot; reel</td>
<td>Up to 16 hrs. on a 7&quot; reel</td>
<td>Up to 32 hrs. on a 7&quot; reel</td>
<td>Up to 32 hours on a 7&quot; reel</td>
</tr>
<tr>
<td>WEIGHT</td>
<td>7 lbs.</td>
<td>18 lbs.</td>
<td>30 lbs.</td>
<td>29 lbs.</td>
<td>38 lbs.</td>
</tr>
</tbody>
</table>

| MANUFACTURER’S SUGGESTED LIST PRICE | $129.50* | $179.50* | $239.50* | $299.50* | $399.50* |

*For complete technical data and detailed descriptions of Norelco ‘Continental’ Tape Recorders, write:

NORTH AMERICAN PHILIPS COMPANY, INC., High Fidelity Products Division, 100 East 42nd Street, New York 17, New York

*The unit prices stated above are for identification only and are not necessarily the regular or usual retail prices and are not to be represented as such.
**KARG**

- Model XTX-14: Crystal-controlled stereo FM Tuner. 121/2" cascode front end; 2 audio stages; Foster-Steely detector; 1 stage per channel; output signal 3 volts; 3 output coils; multistage volume control; volume switch-Stereo, Mono, off. Price $199.95.

**McINTOSH**

- Model 827: FM-AM Stereo Tuner. A sensitive FM/AM stereo tuner having the new McIntosh cascode multiple-stripped circuitry and a front panel MULTIPATH indicator.

**LAFAYETTE**


**LEAK**


**LAMANTZ**


**PIERSON**


**SHERWOOD**


**SHERWOOD**


**BASIC TUNER KITS**

- FM-1 Tuner Kit plus FM-X3 multiplex integrator. Kit is a full-performance tuner, with provision for wiring to any FM-X3 multiplex integrator at any time, which converts it to a fully automatic stereo FM tuner.
... brings you equipment of unsurpassed quality

From Switzerland, where craftsmanship and music are traditional.

THORENS TURNTABLES

THORENS TD-224 - World's first tunable and automatic record changer. Provides the quality of undistorted, single-play performance with the convenience of automatic record changing. Includes BTD-125 tone arm, illuminated strobe plus many other features never before combined in a single instrument. .............. net $250.

THORENS TD-124 - The recognized standard of quality for transcription turntables, regardless of price. Offers a host of exclusive features for the finest systems. .. net $125.00 For single speed, performance, convertible as required, see the TD-121 at $95 net.

THORENS TD-135 - First integrated unit to feature a true transcription arm, the Thorens BTD-125, plus a "TD" quality tunable. Outstanding adjustment flexibility, precision mounting and other quality features assure perfect performance. No other integrated unit approaches its professional standards. net $125.00

FREE! CATALOG Largest and greatest of all ELPA catalogs. Write for Free Catalog and name of nearest dealer, Dept. A

Searches everywhere in the world, Elpa selects the finest components from the finest craftsmen and brings them to you with the promise of unsurpassed performance. Let Elpa guide you to the peak of enjoyment in the world of high fidelity.

From England, where high fidelity first earned its reputation.

Cecil E. Watts

Record Cleaning Equipment

NEW PREENER - Provides the perfect solution for a dust-free record collection. Plush pile penetrates each groove, removes all dust and grit, as well as static ............ $3.00

NEW PARASTAT - Brings older records back to life. Preens new records and keeps them new. Ideal accessory to restore fidelity to older records .................. $15.00

THE ORIGINAL DUST BUG - Attaches to any tunable in seconds. Carefully designed and pre-balanced for minimum force. Height adjustment screw for maximum cleaning efficiency ........................ $6.00

NEW CHANGER DUST BUG - Fits on any record changer arm without interfering with its performance .................. $5.00

From Denmark, where fine design is the hallmark of quality.

Orthofon

Tone Arms and Cartridges

ORTOFON SPU-T - The finest professional quality stereo cartridge available anywhere in the world. Available for any high-quality universal stereo arm. Distortion-free reproduction. Life-long diamond stylus. net $45.00 SPU/ST - available premounted in plug-in shell for SME & all Orthofon tone arms. BTD/SPU available premounted in Thorens plug-in shell ................ net $49.95 NEW! AVAILABLE in any of the above models equipped with Ortofon exclusive ELLIPTICAL STYLUS ........................ net $75.00

(net illustrated)

ORTOFON RMD-309 - The ultimate in tone arm efficiency and simplicity. This 19" arm features finest highest quality professional pivot gimbal suspension and other professional features. net $59.95 ORTOFON RMD-212 - is highest quality 12-inch professional arm, with all features of the RMD-309 plus lateral balancing; net $54.95 ORTOFON SMG-212 - A 12-inch tone arm distinguished by both technical excellence and economy. Laterally balanced to provide perfect tracking even up to 30° out of level. net $29.95 ORTOFON SKG-212 with calibrated counterweight and other fine features, offers greatest economy ................ net $19.95

ELPA MARKETING INDUSTRIES, Inc. / NEW HYDE PARK, NEW YORK

In Canada: Tri-Tel Associates Ltd., Willowdale, Ont.
EICO

**Specifications:**
- 11 tubes: cathode-coupled front end; 4 l.f. stages; balanced bridge detector; 2 audio stages; EM-84 tuning indicator; output signal 0.5 volts; 2 outputs: control—tuning; volume; switched—on/off; resp. at 0.5 db from 10 to 40,000 cps; signal-to-noise ratio 75 db; HF volume sensitivity 0.5 av; capture ratio 3.5 db; HF usable sensitivity 1.5 av. AM suppression 25 db; harmonic distortion (100% mod.) 0.15%; AM separation 60 db; envelope detection stereo circuit; drift less than 30kc; dimensions: 5%, 4% high, 5% deep, weight. 12 lbs. Other features—fully automatic tuning from mono to stereo with indicator light. Price: $120.00.

Fish

**Specifications:**
- 11 tubes: 4 f.l. stages; ratio detector; meter tuning indicator; output signal 1 volt; signal-to-noise ratio 55 db; capture ratio 5 db; HF usable sensitivity 5 av; harmonic distortion (100% mod.) 0.6%; hf separation 25 db; envelope detection stereo 20 db; dimensions: 15% wide, 5% high, 15% deep; weight: 19 lbs. Price: $925.00. Scenic.

HARMAN-KARDON

**Specifications:**
- Citation HX FM-Tuner. All the complex stages pre-aligned and adjusted at the factory. Features: wide-band circuitry, excellent sound quality. Built-in multiple-adaptor, and high stability. Specifications: 7 tubes; Novistor front end; 3 f.l. stages; Foster-Neet detector; 2 audio stages; Level & Balance tuning meters; output signal 2 volts; 3 outputs: controls—

**TUNER-AMPLIFIERS**

ALTEC

**Specifications:**
- 705A Astro, AM-FM Stereo Tuner-Amplifier. This small amplifier is typical of the next grade of equipment that can be found in the broadcast or record player in the extent, which it will fit the buyer. It features power transis-

PACO

**Specifications:**
- 12 tubes: grounded-grid front end; 4 l.f. stages; Foster-Neet detector; diode output tuning indicator; output signal 1.5 volts; 2 outputs; controls—FM—off, AM—off, a.f.c. function; freq. resp. ± 0.5 db from 20 to 10,000 cps; AM separation 60 db; harmonie distortion (100% mod.) 0.15%; AM separation 60 db; microphone output; 40 volts; Price: $119.95. Scenic.
Now you know why you waited

KLH has just introduced a new speaker system — the Model Fourteen — designed to accomplish two objectives: — to reproduce music (1) with less distortion and (2) with more bass than has heretofore been possible for a small speaker system. Inside the compact enclosure of this new speaker are a number of vital departures from any speaker system ever produced before.

The Model Fourteen employs two extremely compliant full-range speakers. The diameter of their cones is only 3". Their maximum excursion is ¾". This excursion is controlled by the highest ratio of magnet power to cone lightness ever engineered into a loudspeaker.

There are a series of problems involved in achieving good bass response in a small speaker system. First, all speakers roll off in the bass region. Small speakers have higher resonant frequencies and roll off at higher frequencies than large speakers. But a large speaker is not effective in a compact enclosure. The conventional small speaker is no better, since it cannot move enough air to produce respectable bass.

In the Model Fourteen, part of the answer is a small speaker with a very powerful magnet and long excursion. This provides two great advantages — the ability to move large volumes of air, and the precise control over cone movement necessary for freedom from distortion. It also provides a problem, however, since the damping effect of the heavy magnet increases at the lower frequencies. This reduces the bass output of the speaker.

The rest of the answer is the first use, in a small multi-speaker system, of a revolutionary technique which we call frequency contouring. This technique was pioneered by KLH in the now famous Model Eight FM Receiving System and Model Eleven Portable Stereophonic Phonograph — each generally conceded to be the finest example of its class yet produced. Incorporated in the Model Fourteen is a passive electronic network which reshapes the power output of any conventional amplifier to match exactly the low frequency power requirements of the speakers, so that their response curve remains flat far below its normal roll-off point.

This technique can only be applied successfully with speakers whose low frequency response is held precisely to a profile of certain specific characteristics. Only because the speakers used in the Model Fourteen — including their impregnated paper cones — are designed and manufactured in our own plant can they be held to the rigid uniformity required for the use of frequency contouring. No commercially supplied cones have the necessary uniformity. No other manufacturer of small full-range speakers produces its own cones.

The result is a range and quality of reproduction you have never heard before in a compact speaker. The Model Fourteen, at any given level of overall loudness, will deliver more bass power, at lower frequencies, with less distortion than any other speaker system in the same range of cost or size.

The Model Fourteen's dimensions are 18" x 14" x 3 ¾". The price is about $50. Wait no longer.
tors in the output stage to provide transient response at least 0.1% output with low heat generation, allowing the unit to be mounted safely in a home or office environment.

**Specifications:**
- **Total:** 15 tubes, 12 triodes and 3 tetrodes, all in a single, compact cabinet.
- **Bias:** 12-volt grid bias, 350 volts plate bias.
- **Tubing:** All tubes are 12-volt grid bias, 350 volts plate bias.
- **Electrolytic capacitors:** 15,000 volts, 0.1% tolerance.
- **Diodes:** 12-volt grid bias, 350 volts plate bias.
- **Amplifiers:** 12-volt grid bias, 350 volts plate bias.
- **Drivers:** 12-volt grid bias, 350 volts plate bias.
- **Input impedance:** 100 ohms.
- **Output impedance:** 8 ohms.
- **Frequency Response:** 20 Hz to 20,000 Hz.
- **Signal-to-Noise Ratio:** 70 dB.
- **Harmonic Distortion:** 2.5%.
- **Output Power:** 100 watts per channel.
- **Price:** $389.50.

**BOGEN**

- **Model:** TA7000X 70-watt AM/FM stereo receiver.
- **Price:** $389.50.

**KLH**

- **Model:** 8-Channel 30-watt FM stereo receiver.
- **Price:** $249.95.

**GROMMES**

- **Model:** KS-1 30-watt FM/AM stereo receiver.
- **Price:** $329.50.

**KENWOOD**

- **Model:** KX-14 30-watt stereo receiver.
- **Price:** $249.95.

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**HARMAN-KARDON**

- **Model:** TA3000X 30-watt FM stereo receiver.
- **Price:** $249.95.

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**FISHER**

- **Model:** 350-A 12-Watt Stereo Multiplex Receiver.
- **Price:** $299.95.

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**BELL**

- **Model:** 441-S2 Stereo Receiver.
- **Price:** $269.95.

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**GROOMES**

- **Model:** KS-1 30-watt FM/AM stereo receiver.
- **Price:** $329.50.

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**KENWOOD**

- **Model:** KX-14 30-watt stereo receiver.
- **Price:** $249.95.

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**BOWEN**

- **Model:** RP60 FM/AM stereo receiver.
- **Price:** $269.95.

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**GROOMES**

- **Model:** KS-1 30-watt FM/AM stereo receiver.
- **Price:** $329.50.

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**KENWOOD**

- **Model:** KX-14 30-watt stereo receiver.
- **Price:** $249.95.

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**BOWEN**

- **Model:** RP60 FM/AM stereo receiver.
- **Price:** $269.95.

---

**GROOMES**

- **Model:** KS-1 30-watt FM/AM stereo receiver.
- **Price:** $329.50.
NEW
ALL-TRANSISTOR
ALL-MODE TUNER
by HEATHKIT®

new Heathkit AM-FM-STereo transistor tuner kit $119.95

It's new, it's deluxe, and it's all transistor! That's the Heathkit AJ-43 Transistor Tuner featuring the very latest in solid-state circuitry for more features, greater listening pleasure. Sensitive, automatic, and ready to capture any broadcast your choose... up-to-the-minute AM... beautifully quiet FM... and thrilling, natural FM Stereo! Truly deluxe... styled in tasteful tan vinyl-clad steel to complement any decor, quietly... to match our other deluxe Heathkit stereo equipment. If you prefer the finer things, the latest in the state of the art you'll love the Heathkit AJ-43!

Kit AJ-43, 18 lbs., no money down, $11 mo. $119.95

Matching All-Transistor Stereo Amplifier
For balanced performance and appearance, choose the Heathkit AA-21... 28 transistors, 10 diodes, 70 watts! 28 lbs.
Kit AA-21, $13 mo. $139.95
Assembled AAW-21, $16 mo. $167.95

FREE HEATHKIT CATALOG
Fully describes over 950 exciting, easy-to-build Heathkit products for stereo FM, Amateur Radio, Test, Marine, Educational, and Home Entertainment. See how you can save up to 50% on equipment and have fun doing it! Send for your free copy today!

HEATH COMPANY
Benton Harbor 41, Michigan

The latest in features:
- 24 transistors, 8 diodes
- Built-in stereo circuitry
- Automatic stereo indicator
- Automatic switching to eliminate manual switching to receive stereo
- Built-in Automatic Frequency Control and Automatic Gain Control
- Adjustable FM squelch
- Stereo phase control
- Filtered stereo tape recorder outputs
- Built-in AM & FM antennas
- Separate AM & FM tuning meters
- Lighted slide-rule dial
- Flywheel tuning
- Regulated power supply
- Factory assembled FM tuning unit and 6-stage IF circuit board
- Concealed secondary controls behind hinged lower front panel

FREE HEATHKIT CATALOG
Fully describes over 950 exciting, easy-to-build Heathkit products for stereo FM, Amateur Radio, Test, Marine, Educational, and Home Entertainment. See how you can save up to 50% on equipment and have fun doing it! Send for your free copy today!

HEATH COMPANY
Benton Harbor 41, Michigan

It's new, it's deluxe, and it's all transistor! That's the Heathkit AJ-43 Transistor Tuner featuring the very latest in solid-state circuitry for more features, greater listening pleasure. Sensitive, automatic, and ready to capture any broadcast your choose... up-to-the-minute AM... beautifully quiet FM... and thrilling, natural FM Stereo! Truly deluxe... styled in tasteful tan vinyl-clad steel to complement any decor, quietly... to match our other deluxe Heathkit stereo equipment. If you prefer the finer things, the latest in the state of the art you'll love the Heathkit AJ-43!

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Fully describes over 950 exciting, easy-to-build Heathkit products for stereo FM, Amateur Radio, Test, Marine, Educational, and Home Entertainment. See how you can save up to 50% on equipment and have fun doing it! Send for your free copy today!

HEATH COMPANY
Benton Harbor 41, Michigan
**LAFAYETTE**

- L-2246 40-Watt FM/AM Stereo Receiver. 'Pilot Monitor' stereo indicator shows when station tuned to FM stereo multiplex broadcast, 2-gang tuning capacitors, front panel stereo headphone receptacle.

**PILOT**

- Model 776. Integrated, high performance AM/FM stereo receiver. Excellent signal-to-noise ratio, extremely low distortion. Center-speaker output. Frequency-response 20 Hz to 100,000 Hz. Bandwidth: AM = 4 kHz; FM = 50 kHz. Maximum output: 30 watts per channel. Weight: 15 lbs. AM = 4 tubes; 10 watts per channel. FM = 8 tubes; 10 watts per channel. Dimensions: 17%" wide, 6%" high, 14%" deep.

**SPECIFICATIONS**

- FM: 10 tubes; 1/4-stage Foster dete- cted; i.f. detector; 2-chassis tuning indicator; output 20 watts per channel. AM: 4 tubes; 1/4-stage Foster detector; i.f. detector; 2-chassis tuning indicator; output 10 watts per channel. AM - FM Superhet-style receiver. 24 volt supply. Weight: 25 lbs. AM = 4 tubes; 10 watts per channel. FM = 8 tubes; 10 watts per channel. Dimensions: 17%" wide, 6%" high, 14%" deep.

- $419.00 Lafayette Radio.

**SHERWOOD**

- S-8000 III FM-Stereo 80-Watt Receiver. This unit contains all of the electronics for a complete home stereo system. Includes a complete single channel. The S-8000 III features 24- watt amplifiers, complete with dual preamp for phone and tape plus a highly sensitive receiver. Use with complete line of Sherwood radio tuners for receiving PCC-approved FM multiplexed systems. Just add amp and speakers to complete your stereo home music system.

- This unit is $499.00. Sherwood Electronic Labs.

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**TUNER AMPLIFIER KITS**

**DYNAKIT**

- D-718 FM/MPX Tuner/Amplifier. The 718S features a complete, two-tube tuner, 10 tubes. Weight: 34 lbs. Price $499.00.

- S-8000 III FM-Tuner Amplifier Kit. The 718S offers all the features of the 718S, but allows you to build your own. Weight: 34 lbs. Price $499.00.

- D-718 Amplifier Kit. The 718S offers all the features of the 718S, but allows you to build your own. Weight: 34 lbs. Price $499.00.

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**SHERWOOD**

- S-8000 III FM-Stereo 80-Watt Receiver. This unit contains all of the electronics for a complete home stereo system. Includes a complete single channel. The S-8000 III features 24-watt amplifiers, complete with dual preamp for phone and tape plus a highly sensitive receiver. Use with complete line of Sherwood radio tuners for receiving PCC-approved FM multiplexed systems. Just add amp and speakers to complete your stereo home music system.

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**EICO**

**NEUMANN MICROPHONES**

**NEW! U-67 CONDENSER STUDIO MICROPHONE**

CULMINATION OF OVER 30 YEARS OF ELECTRONIC LEADERSHIP!

Contains the following advanced features:

1. Electronically switched directional characteristics: Cardioid, Omni-directional, Figure-8.
2. Frequency response with virtually no peak at the high end.
3. Separates "Voice-Music" switch raises the roll-off starting point from 40 cps to 100 cps.
4. Sensitivity switch on microphone prevents overload of amplifier from close placement to sound source.
5. "Calibrating input" permits direct testing of microphone preamplifier with oscillator.
6. Uses regular EF-86 tube, readily replaceable.

Complete system includes: Microphone, Power supply, Interconnect cable and stand mount.

**NEUMANN M-49b CONTINUOUSLY ELECTRONICALLY VARIABLE DIRECTIONAL PATTERN MICROPHONE SYSTEM**

This microphone permits remote control of the directional characteristic. A smooth, continuous fader control selects any of the basic directional patterns (non-directional, bi-directional, and cardioid) and any intermediate pattern. Wide frequency response with extremely low distortion—0.6% 40-15 kc up to 110 db absolute.

Complete microphone system consists of microphone, power supply, and MZ 49 Swivel-mounting harness.

**NEUMANN KM-54a/KM-53a**

The KM-54a is a super cardioid miniature microphone that has been designed with tv and film in mind. This 1/2" diameter by 5" long, 3/8 ounce mica, when mounted in the 2.38 full elastic suspension, can be aimed at the sound and provide more than 25 db rejection of extraneous sound in the studio.

Complete microphone system consists of microphone, power supply, inter-connect cable, output connector.

**NEUMANN KM-56 MINIATURE CONDENSER MICROPHONE SYSTEM**

The KM-56 satisfies a great demand for a microphone of modern, miniature styling of unequaled reliability and performance. It is a true self-contained condenser microphone incorporating electronic switching of the directional characteristic (U.S. Pat. No. 2,674,867) to all three patterns: Omni-directional, Bi-directional, and Cardioid. It uses a pure nickel double diaphragm capsule offering high resistance to temperature and humidity effects.

Complete microphone system consists of microphone, power supply, inter-connect cable, output connector.

**EMT 140 SERIES REVERBERATION UNITS**

Demanded by discriminating Radio, TV and Recording Studios everywhere for the most natural sounding artificial reverberation.

Decay period variable from 0.5 to 5.50 seconds, hand wheel adjusted or by optional remote control. Suspended steel plate creates high spectrum density decay.

Complete with amplifiers, moving coil driver and two contact pick-up microphones (prepared for Stereo conversion).

EMT 140 st. stereo unit slightly higher. A natural for Stereo recording, "Stereoizing" Mono Recordings and FM Stereocasters.

Space requirements: 1'x 0'6"x 8'.

Information concerning all other EMT products available on request.

COMPLETE TECHNICAL SPECIFICATIONS WILL BE PROMPTLY FURNISHED UPON PROFESSIONAL REQUEST.

**GOTHAM AUDIO CORPORATION**

2 WEST 46 STREET, NEW YORK 36, N. Y. * (212) CO 5-4111

AUGUST, 1963
**VOICE OF MUSIC II**

**DUAL**

- **OMS-909 Magnetic Sterling Cartridge**

  Feature excellent performance with tracking force of less than 5 grams. The dual OMS-909 is constructed so that stylus can be easily replaced—just lift out the caddy grasped assembly.

  **Specifications**:
  - Variable reluctance: freq. resp. 20 to 20,000 cps; 2 db; output, 1 mv/cm rec. velocity; channel separation, 35 db at 1 ke; recommended load, 12-47 k ohms; recommended tracking force—professional arms, 1.5-5 gms, changers 2-5 gms; compliance—linear 4 x 10^-6 cm/dyne, vertical, 3 x 10^-6 cm/dyne; inductance, 940 mhos; d.c. resistance, 900 ohms/channel; no. of terminals, 4; mounting dimensions, std.; weight, 14 gms. Price, $14.95; replacement styl, $17.25. United Audio.

**PACO**

- **Model ST-29 FM Tower-Amplifier**

  The ST-29 amplifier is a uniquely designed, built-in multiple jacks to accommodate multiple adaptors, switched ceramic cartridge, switched base boost.

  **Specifications**:
  - FM: 7 tubes; grounded-grid front end, 3 L.F. stages; radio detector; 1 audio stage; tube tuning indicator; output 1 volt; output controls—tuning volume; switches—in, off, a.f., function, channel. Amplifier: AF gain 30 db; AM gain 25 db; variable semiconductor a.f. circuit; drift 20 ke. AM: 60 to 15,000 cps 2 db harmonic distortion, 3.5% at 1 ke; output impedances 4, 8, 8 ohms; inputs—1 phono, 15", 13", 10", vertical, 5 7/16" high, 1 5/8" deep, Price $64.95. EICO.

**HARMAN-KARDON**

- **Model 2100 R-X 45-Watt FM-Stereo Receiver Kit**

  Sensitivity FM tuner with r.f. and oscillator stage preassembled and factory aligned, stable stereo adapter, 30-watt amplifier featuring output transformers with special grain-oriented cores; all solid-state solid-state circuit; all input and control facilities.

  **Specifications**:
  - Frequency range: 7 tubes: triode/tetrode front end; 3 L.F. stages; radio detector; output off/slow/2 outputs; output, 100 db at rated output, 100 watts per channel; power output, 25 watts per channel; power output, 30 watts per channel; frequency response, 100 Hz to 10,000 Hz; distortion 0.2% at 1 watt; output impedances, 8, 16 ohms; inputs—mag. phone, tape head, tape amp. aux.; dimensions, 15" x 16" x 9"; weight, 125 lbs. Price $395. Harman-Kardon.

**DYNACO-B&O**

- **Stereodyne II**

  Magnetic-motor-driven stereo cartridge featuring a symmetrical design utilizing a quadri-pole push-pull circuit providing low inductance, a hum-reducing push-pull system, and complete molded shielding for noise-free hum pickup under any conditions. High output ensures a superior signal-to-noise ratio. Exceptional tracking, high compliance, and low moving mass for prolonged record and stylus life.

**PHONO CARTRIDGES**

- **ADC**

  - **ADC-1**
    
    Designed for use with tone arms and turntables of the highest quality, the ADC-1 is individually calibrated and comes with complete performance report card. The stylus can be replaced in less than 10 seconds and comes out with a flick of your finger—no tools or special skill are required.

  **Specifications**: Freq. resp. 10 to 20,000 cps 1 db; output, 1.25 mv/cm rec. velocity; channel separation, 35 db at 1 ke; recommended load, 47 k ohms; recommended tracking force—professional arms, 2-6 gms; changers 1.5 gms; compliance—linear 7 x 10^-6 cm/dyne, vertical, 1 x 10^-6 cm/dyne; inductance, 100 mhos; d.c. resistance, 1000 ohms; mounting dimensions, std.; weight, 12 gms. Additional features: extremely low hum pickup; replaceable stylus; built-in protection feature (retractable within nose cone). Price, diamond, $29.95; replacement styl, $14.45. Dynaco.

- **EMPIRE**

  - **Model 886P Dyna-Life stylus**, one of the lightest, hand-polished diamond 0.5 mil radius tip.

  **Specifications**: Freq. resp. 8 to 20,000 cps 1 db output, 1 mv/cm rec. velocity; channel separation, 35 db at 1 ke; output, 1.25 mv/cm rec. velocity; channel separation, 35 db at 1 ke; recommended load, 47 k ohms; recommended tracking force—professional arms, 2-6 gms; changers 1.5 gms; compliance—linear 7 x 10^-6 cm/dyne, vertical, 1 x 10^-6 cm/dyne; d.c. resistance, 900 ohms; mounting dimensions, std.; weight, 12 gms. Additional features: No magnetic attraction, virtually indentured "Dyna-Life" stylus. Price, diamond, $19.95; replacement diamond stylus, $13.95. Empire Scientific.

- **FAIRCHILD**

  - **F-7 Stereo Cartridge System**

    Low output stereo cartridge, moving-coil design, in combination with transistorized pre-amplifier. Preamp has own low-power supply which brings with it a much lower than 10 microamps. Through this combination of low-mass low-output cartridge and self-contained pre-amplifier, the F-7 system has been designed to meet the requirements of the finest portable equipment, including the smallest portable recorders such as those manufactured by Grundig, hmv, and others. Price, $59.95. Additional features: 10 mil stylus. Weight, 12 gms. Price, $39.95; replacement stylus, $14.95.

**KNIGHT-KIT**

- **KT-454 A.M.-F.M. Stereo Receiver Kit**


  **Specifications**:
  - frequency range: 17 tubes; tuned r.f. front end, 12 L.F. stages; tube tuning indicator; controls—bass, treble, volume. Volume control—variable in banks; switches—stereo reverse, stereo-mono, a.f., d.c.; on, off, freq. resp. 20 to 20,000 cps; HF audio sensitivity 2.5 v; stereo separation 20 db at 1 kroh, AM-FM: 20 to 10,000 cps linear rate output. Power output, 16 watts per channel; harmonic distortion, 0.1% at medium output; hum and noise, 72 db below rated output; sensitivity, input for rated output: FM, 10 microvolts; AM, 10 millivolts; 50 watts per channel; power output, 25 watts per channel; harmonic distortion, 0.2% at 1 watt; output impedances, 8, 16 ohms; inputs—mag. phone, tape head, tape amp. aux.; dimensions, 15 1/2" wide, 5 1/8" high, 15 1/2" deep. Price $104.95. EICO.

**BENJAMIN ELAC**

- **ELAC 322 with 0.32-diamond Stylus**

  The new ELAC 322 magnetic cartridge is specifically designed for stereo records and utilizes a 0.32-diamond stylus. Maximum compliance has been obtained by reducing moving mass without sacrificing stylus length and stiffness. The improved tracking force—professional arms, 0.75-1.5 gms, effective stylus mass, 0.5 mg; compliance—linear 30 x 10^-6 cm/dyne, vertical, 20 x 10^-6 cm/dyne; inductance, 80 mhos; d.c. resistance, 1000 ohms; mounting dimensions, std.; weight, 9 gms. Additional features: No magnetic attraction; virtually indestructible "Dyna-Life" stylus. Price, diamond, $39.95; replacement diamond stylus, $13.95. Benjamin Elac.
With the Energizer/Transducer, JBL brings you another giant stride closer to perfect audio realism. Now you can have a JBL precision transducer with its own built-in power mate. By engineering the transducers, power source, and enclosure as an indivisible entity, the designers have complete control over every facet of the reproduction system. They have discretion over any band of frequencies, can govern the size and shape of a single cycle if they so will. Consequently, in the JBL Energizer/Transducer the amplified signal is precisely tailored to the requirements of the entire system. The music you hear is the most exact replica of the original performance yet achieved. Built entirely of solid state devices, the energizer is devoid of microphonics, produces negligible heat, and therefore can be mounted within the acoustical enclosure. Due to their tight electrical and mechanical coupling, JBL transducers reproduce the steepest musical wave fronts with an accuracy, alacrity, and facility that is unique among loudspeakers. The energizer has the ability to amplify square waves perfectly. The combination of these two features results in system transient response that has never been equalled. Hum is extinguished. Distortion in any form approaches the vanishing point. Frequency response is flat. Sound pressure reserves are available that you will never use even in your most avid listening sessions. Initially, JBL self-powered loudspeakers are offered in E/T Olympus, E/T Apollo, and E/T Lancer 66 models. Telephone the JBL Franchised Audio Specialist in your community; arrange for a protracted audition; be sure to compare what you hear with conventional loudspeaker and amplifier systems. Write for complete information.

JAMES B. LANSING SOUND, INC., LOS ANGELES 39, CALIFORNIA

AUDIO • AUGUST, 1963
amplifier the F-7 has low distortion and pro-
longed life of record collection through use of low
tracking forces.

Specifications: Freq. response 20 to 20,000
cps; output, cartridge 0.5 mv; output of pre-
preamplifier 10 mv (1 k, 5 cm/sec); channel
separation, 22 db at 1 k; recommended load,
250 ohms; recommended tracking force—pro-
fessional arms, 1.5-3 gms; compliance—
linear velocity, 13.4 x 10^-6 cm/dyne; vertical,
0.9 x 10^-6 cm/dyne; d.c. resistance, 1100
ohms; no. of terminals, 4; mounting di-
mensions, 127.7 mm; weight, 13.5 gms. $40.50
(7.5-mil), $59.50 (0.3-mil). Neat.

NEAT

NEAT 1000 Moving- Coil Cartridge. A high
quality moving-coil cartridge featuring easily
replaceable stylus assembly. The output is rela-
tively high for a moving coil and the frequency
range is relatively wide.

Specifications: Type, moving coil; freg. res-
ponse 20 to 20,000 cps; output, 5 mv; chan-
nel separation, 30 db at 1 k, 20 db at 10 k;
recommended load, 100-1000 ohms; recom-
mended tracking force—professional arms,
2 gms; compliance—linear, 10 x 10^-6 cm/dyne,
vertical, 10 x 10^-6 cm/dyne; d.c. resistance,
50 ohms; no. of terminals, 4; mounting di-
mensions, 27.7 mm; weight, 13.5 gms. $50.00
(0.5-mil), $80.00 (0.3-mil). Neat.

GENERAL ELECTRIC

● FR-1064-7 Orthotic Stereo Cartridge. A
6.7 mil diamond cartridge featuring the variable
resistance principle of operation. The
wide frequency response, 20-20,000 cps, per-
mits the reproduction of more of the subtle
colored sound frequencies. The base response in
the laboratory and clinical series is identical.
Specifications: Freq. response 20 to 20,000
cps; output, 1 mv/cm rec. vel.; channel separa-
tion, 25 db at 1 k; recommended load, 250 ohms;
weight, 8 gms; compliance—linear, 4.5 x
10^-6 cm/dyne; vertical, 3.5 x 10^-6 cm/dyne;
weight, 13.5 gms. Price, diamond, $37.50;
replacement stylus, $0.50. General Electric.

● ORTOFON

● RV-37 Cartridge. The Orthotic stereo car-
tridge, Model RVJ, has extremely high com-
pound and low inertia of the stylus arma-
ture. The effective diamond elements are worn
with an extra pure copper wire in fine tung
style. Thus, the inertia and directional forces
are reduced to a minimum and consequently
the force required for tracking is reduced on both
ends of the audio spectrum is very small. The stylus
armature is composed of a special taper and fluid
bearing alloy strip to ensure compliance in both
planes. "Prime diamonds" are used for the stylus.

CRADO

● "Classic" Stereo Cartridge. The Classic car-
tridge features the same basic design as the Lab-
oratory Series cartridge, and is manufactured
on a small assembly line basis with extremely
close tolerances. The base response in the Labora-
atory and Classic Series is identical. The
midrange is very close, and the high frequency
response differs but slightly.

Specifications: moving coil; freq. resp. 15
to 20,000 cps; output, 0.5 mv/cm rec. vel.;
channel separation, 20 db at 1 k; recom-
manded load, 470 ohms; weight, 7.5 gms;
compliance—linear, 4 x 10^-6 cm/dyne; verti-
cal, 3 x 10^-6 cm/dyne; weight, 13.5 gms. Price,
diamond, $29.95.

● ORTOFON

● VU-17 Cartridge. The Orthotic stereo car-
tridge, Model RVJ, has extremely high com-
pound and low inertia of the stylus arma-
ture. The effective diamond elements are worn
with an extra pure copper wire in fine tung
style. Thus, the inertia and directional forces
are reduced to a minimum and consequently
the force required for tracking is reduced on both
ends of the audio spectrum is very small. The stylus
armature is composed of a special taper and fluid
bearing alloy strip to ensure compliance in both
planes. "Prime diamonds" are used for the stylus.

SONOTONE

● "Velosonic" Mark III. Designed for supe-
rior velocity, magnetic or reed input sys-
tems, produces signals free of magnetic hums.
Mark III version utilizes new "Sonoflex" styli-
les virtually eliminating broken needles and
increasing compliance.

Specifications: Freq. response 20 to 20,000
cps; channel separation, 25 db at 1 k; output,
2.5 mv; channel separation, 25 db at 1 k;
recommended load, 47,000 ohms; recommend-
ed tracking force—professional arms, 2.4 gms;
compliance—linear, 6 x 10^-6 cm/dyne; verti-
cal, 6 x 10^-6 cm/dyne; capacitance 490
pF; no. of terminals, 4; mounting dimensions, std.;
weight, 3.2 gms. Price, dual diamond, $22.25;
sapphire-diamond, $29.25, replacement stylus,
$0.65; $0.00. Sonotone.

SONOVOCX

● SX-1 Stereo Cartridge. The Sonovox SX-1
represents a refinement in moving-magnet car-
tridge design. The magnet is spherical in shape thus
achieving a uniform field. Extremely low mass
and high compliance of the vibrating system pro-
duces a minimum record wear.

Specifications: Moving magnet; freq. res-
pense, 20 to 20,000 cps; output, 0.5 mv; chan-
nel separation, 20 db at 1 k, 20 db at 10 k;

MICRO

● M-1007 Moving- Magnet Cartridge. Moving-
 magnet cartridge with unusual magnet structure
which reduces stylus mass.

Specifications: Freq. response 20 to 20,000
cps; output, 0.5 mv; channel separation, 22 db at 1 k;
recommended load, 100 ohms; recommended track-
ing force—professional arms, 1.5-3 gms; com-
pliance—linear, 15 x 10^-6 cm/dyne; vertical,
0.9 x 10^-6 cm/dyne; vertical, 0.9 x 10^-6 cm/dyne;
no. of terminals, 4; mounting dimensions, std.;
weight, 12 gms. Micro Seiki Ltd.
EVEN THE MOST DEMANDING MUSIC LOVERS FIND WHAT THEY ARE LISTENING FOR IN THE REMARKABLE NEW KENWOOD KW-70 AM/FM STEREO MULTIPLEX RECEIVER

(PARTICULARLY WHEN THEY HEAR THE PRICE)

The new Kenwood KW-70 Receiver is a combination tuner preamplifier and amplifier. It receives AM broadcasts, FM broadcasts, stereo records, monaural records, taped stereo, and even TV sound. The works.

Turn the KW-70's tuning dial. The Stereo Indicator tells you when you've got a stereo broadcast in your sights.

Listen.

The KW-70's sensitivity (1.9 mv. for 20 db. quieting) makes weak stations strong.

Amazing separation (38 db. at 400 c.p.s.) keeps the KW-70's channels from striking up disturbing conversations with one another.

If you hear buzzing, there's a bee in the room. If you hear rumble, there's an earthquake in the neighborhood. The KW-70's noise filtering circuits allow no such unmusical intrusions.

Acoustics not right? The separate tone controls for each channel make the KW-70's tone fit the room like wallpaper.

Turn up the volume. 65 watts of musical power comes booming through — 32.5 watts in each stereo channel with a harmonic distortion of only 1% — sound that's big enough for Beethoven, himself.

Want to capture all the beauty of the broadcast on tape? Nothing to it. The Tape Monitor lets you listen to the recording and judge its quality as you tape it.

Now listen to the KW-70's price. Only $269.95.

Have you ever heard such a beautiful sound?

And if you need tuning alone, here's a new tuner that's right at home in the world's finest stereo systems — the Kenwood KW-100-T AM/FM Multiplex Tuner.

The advanced technology that puts the KW-70 Receiver out in front makes Kenwood's new KW-100-T Tuner a superb musical instrument.

Once you hear the KW-100-T, you won't be satisfied with ordinary tuners. Only $139.95. Kenwood Electronics, Inc., 212 Fifth Ave., N.Y. 10, N.Y.; 3700 S. Broadway Pl., Los Angeles 7, Calif.

Kenwood

THE SOUND IS PRICELESS...THE PRICE IS LESS

*U.S. PATENT PENDING
recommended load, 50k ohms; recommended tracking force—professional arms, 3 gms; compliance—vertical, 3 x 10^-6 cm/dyne; arm resonance 23.8 cps, to 20,000 cps; weight for cartridge integrated into arm, 25 gms.

Empire

Model 500 Dynamically-Balanced Arm. Dynamic balance achieved by means of offset pivot design. Calibrated arm scale. (deviates at 0.01 gm.) Stylus overhang adjustment. Vertical height adjustment for both arm & arm rest. Electronic plus-orientation—no vibration or shock. Automatic "Lyra Lift"—lifts arm from record at end of play.

Specifications: Over-all length of arm, 12"; distance from arm axis to turntable spindle, 8 1/2"; height range of turntable, 1° to 3°; stylus force range, 0 to 7 gms; arm material, aluminum; pickup mounting, 4 pins, diamond coning, off-set angle, 22.7°; range maximum tracking error, ±0.65 deg.; cartridge, diamond, $49.50; extra pickup heads, $6.40. Gray Div. 205 Series 12" transcription turn arm $85.00.

Fairchild

360 Anti-Skating Arm and SME Stereo Cartridge Combination. Integrated arm-cartridge with "anti-skating" that counteracts tendency of an arm to "skate" toward center of record. Model 500 is free from erratic and imprecise stylus tracking and resulting track distortion. SME cartridge integrated into arm provides high compliance and high separation over a wide frequency range.

Specifications: Over-all length of arm, 12"; distance from arm axis to turntable spindle, 8 1/2"; height range of turntable, 1° to 3°; stylus force range, 0 to 7 gms; arm material, aluminum; pickup mounting, 4 pins, diamond coning, off-set angle, 22.7°; range maximum tracking error, ±0.65 deg.; cartridge, diamond, $49.50; extra pickup heads for Model 500A/501 only $4.90. Fairchild Rec.

1. 500A anti-skating arm only w/removable head. ..... $29.95
2. 501 16" anti-skating arm w/removable head. ..... $37.50

Phonos

Dynaco-B&G

Model 46, LDM stereo cartridge. Stress-generating design, 0.075 diamond stylus, 0.3 mil gram tip mass. Compliance more than 20 x 10^-6 cm/dyne at 1/2 gram tracking force, 15 x 10^-6 cm/dyne at 1.2 gram tracking force. Matching networks (included) to low-level input.

Specifications: Freq. response 20 to 10,000 eps ±2 db; output, 0.65 mv/cm rec. velocity; coils separation, 23 db at 1 ke; recommended load, 47k ohms; recommended tracking force—professional arms, 3 gms; inductance, 0.46 mh; d.c. resistance, 1020 ohms; capacitance, 25 pf; 4 terminals; mounting dimensions, 3/4" weight, 11 gms. Price, diamond, $40.50; replacement styls, $19.50. Stanton Magnetics.

Grado

Laboratory Tone Arm. The Grado tone arms incorporate separate orifice adjustments for the front and rear planes of arm movement, a-camels of weight and mass vibration. Tension of balance is a reduced suspension to mechanical shock and acoustic feedback.

Specifications: Over-all length of arm, 10 1/2"; distance from arm axis to turntable spindle, 8 1/2"; height range of turntable, 3" to 10"; type of suspension, balance, with spring; stylus force 3 gms, type of pickup head, slide mounts, arm material, aluminum; pickup mounting, 4 screws, stabilized, on slide; overhang, 3/8"; maximum tracking error, ±0.5°; addition to overhang adjustable, interchangeable cartridge slides; arm resonance—12 cps, vertical; 18.5 cps, horizontal; w/extra cartridge slides, $2.95. Grado Laboratories.

1. Same, w/Laboratory cartridge ..... $85.00
2. Same, w/Standard cartridge ..... $75.00
3. Same, w/Senator cartridge ..... $63.00

Gray

Broadcast Type Tone Arm, Model 206-S. Transcription tone arm for high fidelity, broadcasting, and commercial sound, dubbing, and pressing inspection.

Specifications: Over-all length of arm, 12"; distance from arm axis to turntable spindle, 8 1/2"; height range of turntable, 1° to 3°; stylus force range, 0 to 12 gms; arm material, aluminum; pickup mounting, on removable slide; screw stud, 3/8"; overhang, 3/8"; range of carriage weight for zero adjustment, to 16 gms; maximum tracking error, 1° 55'; additional features, plug-in cartridge slides, 1" to 2" professional arms, $39.50; additional features, plug-in cartridge slides, 1" to 2" professional arms, $39.50; additional features, plug-in cartridge slides, 1" to 2" professional arms, $39.50; removable, locking edge pickup head; arm material, wood-lined stainless steel; pickup mounting, standard; screw

Specifications: Over-all length of arm, 12"; distance from arm axis to turntable spindle, 8 1/2"; height range of turntable, 1° to 3°; stylus force range, 0 to 7 gms; arm material, aluminum; pickup mounting, 4 pins, diamond coning, off-set angle, 22.7°; range maximum tracking error, ±0.65 deg.; cartridge, diamond, $49.50; extra pickup heads, $6.40. Gray Div. 205 Series 12" transcription turn arm $85.00.

Audio • August, 1963
TWO NEW BRILLIANT CONTRIBUTIONS FOR COMMERCIAL SOUND

BY JENSEN

H-970 COAXIAL
with Compression-Driver Horn-Tweeter.
Here at long last is a genuine coaxial loudspeaker in 8-inch size with compression-driver horn-tweeter. Tweeter horn passes through the woofer core terminating in a circular horn inside and concentric with the woofer diaphragm. This design thus yields a circular (symmetrical) radiation pattern at all frequencies ideal for higher-power high-ceiling distributed sound. Excellent speech intelligibility with high quality reproduction for industrial areas, heavy-duty portable, and central speaker system use.

List Price $4500

F-858 FLEXAIR*
DUAL-CONE—with Super-Low Resonance
Here for the first time is a loudspeaker with super-low resonant frequency designed in the popular 8-inch size with high efficiency and with dual-cone radiating system for unusual response capability at the higher frequencies. Ideal for those too-small speaker enclosures and backboxes in distributed sound systems. Big-speaker lows in compact acoustic enclosures. Available in handy 10-pack with optional pre-attached 70-volt or 25-volt transformer. Jensen KWIKON* Instant Connectors are standard.

List Price $2050

TECHNICAL SPECIFICATIONS

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Write for Specification Sheets
CSP-119 on H-970
CSP-120 on F-858

1 Maximum speech and music level as indicated by VU meter. (Peak power is substantially higher.)
2 Woofer magnet weight only.
3 Axial free field sound pressure level at listed distance (db above .000204 dynes/sq. cm.) in 800-1250 cps warble frequency band.
STANTON

- Model 200 Stanton Unipole Arm. Patented Stanton "Unipole" single-pivot bearing for frictionless motion in all planes. Lightweight construction gives low mass for tracking mono and stereo records at only 1/4 gram.

- 340. The EMT model 840 is a high-precision professional turntable for use with any arm and cartridge combination. Light Flexadisc strobe-calibrated secondary turntable allows accurate cueing to a musical beat, operating by a mechanical brake. Back-up angulation is isolated for all speeds. Tension arm and lowering device. Electronic remote control of turntable brake. Optional accessory kit.

GRADO


TURNTABLES WITHOUT ARMS

EMT

- EMT 840: Specifications: Over-all length of arm, 141/2"; distance from arm axis to turntable spindle, 3/8"; height range of turntable, 1" to 2 1/2"; single-point bearing suspension; stylus force range, 0 to 2 gms; arm material, aluminum and steel; pickup mounting, 1/4 inch; screw spacing, 3/32", offset angle, 15°; maximum turntable clearance, 45, 78 and 45 rpm; motor coupling diameter, 1/2"; motor coupling, 1/2". Price $99.50. Shure Bros.

THORENS

- RTD-128 Tone Arm. This tone arm has been built to match perfectly the high performance of Thorens precision turntables for which it is specially adapted. It will give equally outstanding results on any other turntable presenting a sufficiently low vibration level.

- THORENS

- 130-DP. Quality turntable with time-proven double-belt drive and self-lubricating synchronous motor; provides professional performance. Non-magnetic, dynamically balanced turntable rests on rotating ball thrust bearing in nylon seat. Motor suspension system eliminates vibration. Exceeds NAB specifications. Supplied with heavy gauge steel mounting board; requires only a properly dressed base. Price: arm only, $65; arm and motor, $125; arm, motor, and board, $185. Thorens Industries.

WEATHERS

- MT-66 Universal Stereo Tone Arm. Mounts on any make turntable, accepts any make cartridge; by virtue of interchangeable "plategle" head. Ideal for cartridges capable of tracking at 20 or 30 rpm. Full-time vertical and lateral viscous damping as employed in Famous Wall. Adjustable electronic and microphone tracking force adjustment. No

FAIRCHILD

- 113-BK. Quality turntable with time-proven double-belt drive and self-lubricating synchronous motor; provides professional performance. Non-magnetic, dynamically balanced turntable rests on rotating ball thrust bearing in nylon seat. Motor suspension system eliminates vibration. Exceeds NAB specifications. Supplied with heavy gauge steel mounting board; requires only a properly dressed base. Price: arm only, $65; arm and motor, $125; arm, motor, and board, $185. Thorens Industries.

LAFAYETTE

- PK-24W 4-Speed Transmission Player. Well suited for stereo, the PK-24W is a 4-speed transmission player with a rms-weighted turntable and a ramble and noise figure 50 db below average recorded level. Each speed is variable within 7% of the nominal value through a magnetic eddy-current brake.

THORENS

- Transcription Turntable. Engineered for the finest music systems, the Thorens Model T14L is a four-speed mechanism, plus 1/2-inch, 1/4-inch, 45 and 78 rpm turntables. Price: arm, $65; arm and motor, $125; arm, motor, and board, $185. Shure Bros.
LISTENING TESTS PROVE DYNACO BEST

Specifications are important, but present measurement standards do not fully define how equipment sounds. High fidelity equipment has achieved its ultimate goal when it delivers sound so realistic that skilled listeners cannot distinguish the difference between "live" and "recorded" music in a side by side comparison. This test has been performed dozens of times before thousands of people in programs sponsored by Dynaco, Inc. and AR, Inc. with "live" portions performed by the Fine Arts Quartet. In these comparisons, Dynak's superlative performance was amply demonstrated, since the vast majority of the audiences readily admitted that they could not tell the difference between the electronic reproduction using Dyna Mark III amplifiers and the PAS-2 preamplifier, and the "live" music by the Fine Arts Quartet.

Such perfection in reproduction means that listeners at home can have a degree of fidelity which cannot be improved regardless of how much more money were to be spent on the components used. All Dyna components are of a quality level which permits reproduction indistinguishable from the original. The unique engineering in all Dynakits makes them fully reproducible, so that everyone can hear the full quality of which the inherent design is capable. Dynakits are the easiest of all kits to build—yet they provide the ultimate in sonic realism.

FM-3—An outstanding stereo FM tuner featuring automatic transition to stereo with the Visual Stereocolor. The FM-3 is a super-sensitive drift-free tuner with less than 0.3% distortion at all usable signal levels, four IF stages, wide-band balanced bridge discriminator, and time-switching multiplex system.

FM-3 kit $109.95; assembled $169.95

SCA-35—Combined stereo preamp and amplifier with low noise, lower distortion, and 17.3 watts continuous power per channel. Distortion less than 1/2% at full power from 20 to 20,000 cycles. Unique feedback circuitry throughout. SCA-35 kit $99.95; assembled $139.95

PAS-3—The famous "no distortion" PAS-2 stereo preamplifier with a new look. Wide band, lowest noise, with every necessary feature for superb reproduction, less than 0.1% distortion at any frequency.

PAS-3 kit $69.95; assembled $109.95

STEREO 35—A basic power amplifier similar to that used in the SCA-35, inaudible hum, superior transient response, outstanding overload characteristic, and extremely low distortion at all power levels. Fits behind PAS-3 or FM-3.

ST 35 kit $59.95; assembled $79.95

STEREO 70—A superlative power amplifier—continuous 35 watts per channel with unconditional stability and near-perfect transient response. Frequency response extends below 10 cps and above 40,000 cycles without loss of stability.

ST 70 kit $99.95; assembled $129.95

ASK YOUR DEALER FOR A DYNACO DEMONSTRATION

Write for detailed specifications and descriptive literature.

DYNACO INC. • 3912 Powelton Ave. • Phila. 4, Pa.

Cable: DYNACO Philadelphia

AUDIO • AUGUST, 1963
Specifications:
S33 1/2 & 45 rpm, belt
drive, synchronous motor; turntable diameter, 12"; weight, 34 lbs; shaft diameter, 5/8"; turntable material, aluminum; polyurethane mat; wow, 0.15% flatten, 0.05%; clearance required above mounting board, 0.02%; percentage of time required above mounting board, 20.8/22; below, 2.9%; type of mounting, spring; controls, (1) pushbutton; automatic cycling time, 12 sec at 33 1/3 rpm; 10 sec at 45 rpm; cartridge holder bracket; material plastic; 2 mounting screws for cartridge; mounting dimensions, standard, number of leads to head; 4; number of leads to chassis; 4; all record sizes interchanged. Price $99.95, extra cartridge, 82.10, 45 rpm auto spindle $4.90. United Audio.

EMPIRE

Troubador Model 555. Consists of 208 turntable, 200 arm, w/British Accurate automatic turntable, hysteresis motor, quality tone arm with frictionless bearing, very low rumble level and many other extras.

Specifications:
S33 1/2 & 45 rpm, belt drive; hysteresis motor; turntable diameter, 12"; weight, 6 lbs; turntable material, aluminum; rubber mat; wow and flutter, 0.02%; dimensions of chassis, 17" x 12"; clearance required above mounting board, 3/4", below, 4. Price $172.95. Accessories: cartridge mount, $13.50. Empire Scientific.

1. Model 555, same as above less base $160.00

GARRARD

Type 4. Laboratory Series. Automatic Turntable. A dual-speed automatic turntable, the Garrard Type A Automatic Turntable, is designed to have the convenience of a change. The turntable is made of cast, weight, and polished. The tone arm is adjustable by means of variable height. At this point the arm is in the groove of the turntable track. Tracking force is adjusted by means of a calibrated gauge on the side of the arm. Utilizing the setting-platform changing mechanism exclusive with Garrard, the Type A operates as a fully automatic changer when desired.

Specifications:
S33 1/2, 45, 78 rpm; belt drive; synchronous motor; turntable diameter, 12"; weight, 6 lbs; turntable material, aluminum; rubber mat; wow, 0.01%; flutter, 0.04%; dimensions of chassis, 14 1/2 x 12 1/2 x 3 1/2; clearance required above mounting board, 0.14%; below, 0.05%; type of mounting, spring; controls, pushbutton; automatic cycling time, 12 sec at 33 1/3 rpm; 10 sec at 45 rpm; cartridge holder bracket; material plastic; 2 mounting screws for cartridge; mounting dimensions, standard, number of leads to head; 4; number of leads to chassis; 4; of all record sizes interchanged. Price $199.95, extra cartridge, 82.10, 45 rpm auto spindle $4.90. United Audio.

STANTON

Model 860B Stereotable. Gyroscopic action, the only turntable with magnetic suspension, the platter actually floats on air, eliminating vertical rumble. Unified arm and platter suspension eliminates mechanical feedback. Efficiently mounted motor allowing the base to dissipate vibration. Separate arm mounting board allowing easy access to tone arm receptacles. Unique magnetic arm-mounting techniques.

Specifications:
S33 1/2, 45, 78 rpm; belt drive; synchronous motor; turntable diameter, 12"; weight, 10 lbs; shaft diameter, 1 1/4; turntable material, aluminum; rubber mat; wow and flutter, 0.04%; dimensions of chassis, 14 1/2 x 12 x 3; clearance required above mounting board, 3/8; below, 4. Price $298.00. Accessories: cartridge mount, $13.50. Stanton Magnetics.

THORENS

TD-221. Here is the ultimate in high fidelity quality and convenience—a fine 6 lb. 12" dual-speed automatic turntable. Thorens introduces the TD-221, features a precision of a professional turntable with all the convenience of manual control. More than five years in development, the TD-221 meets the needs of all discriminating perfectionists. It combines the engineering of a TD-124 with an automatic changing mechanism of unusual design.

Specifications:
S33 1/2, 45 78 rpm; belt and idler drive; 4-pole motor; turntable diameter, 12"; weight, 8 lbs; shaft diameter, 5/8"; turntable material, aluminum; polyurethane mat; wow, 0.25%; flutter 0.25%; dimensions of chassis, 13 1/2 x 10 1/2; clearance required above mounting boards, 0.4% below, 3/4; type of mounting, spring; controls, (1) pushbutton; automatic cycling time, 12 sec at 33 1/3 rpm; 10 sec at 45 rpm; cartridge holder bracket; material plastic; 2 mounting screws for cartridge; mounting dimensions, standard, number of leads to head; 4; number of leads to chassis; 4; all record sizes interchanged. Price $493.50. Allied Radio.

WEATHERS

Low-Silhouette Turntable Series, ML-66-A. Low-silhouette turntable complete with vibration.

3. 15 resonance transient the 605A

2. 14 line" cabinets. This

1. LDM version LDM

LOUDSPEAKER MECHANISMS

RICHARD ALLAN

• Slim-Line Loudspeaker, Model CG 127. A quality English import crafted with care and finesse. Suited for building into popular "slim-line" cabinets. This is part of a new range of loudspeakers incorporating the latest advances in magnetic design. The use of ceramic magnets in these speakers results in a considerable reduction in weight and depth. Flux density 14,000 lines per square cm. magnet type Ferrobar, total max 82,000 Maxwells, freq. response 20 to 15,000 cps. Price $65.95, Richard Allen Sales.

1. Model 860 8" $5.49
2. Bronze 8" with whizzer $19.99
3. Bronze 10" $31.99
4. 4107 tweeter $5.99
5. 1214

ALTEC

• 654A Duplex Loudspeaker. An improved version of the famous 904 series, the new 904A provides unusually smooth response in the highs, extremely high linearity, and clean transient response in the lows.

Specifications: Type: duplex; power handling capacity: 50 watts; impedance: 16 ohms; frequency response, from 20 to 22,000 cps; pickup element: L.F. 40 kg. H.F. A 9 kg. voice coil diameter, 1.2". 3". H.F. 1.3": free air resonance frequency 25 cps. Dimensions: dia. 10" deep; weight, 0.7 lbs. with network. Price $168.00, Altec Lansing Corp.

1. 501C $11.00
2. 602C $12.00
3. 505C $15.00
4. 803B $6.00
5. 755C $29.95

less than 2% i/m distortion but...

this alone is not enough. For optimum stereo performance, a cartridge must have stereo integrity as well as fidelity—spatial quality as well as sound quality.

The new Elac 322, with less than 2% intermodulation distortion, and less than 1% harmonic distortion, is capable of producing an almost perfect waveform replica of the sound groove—from 20 to 20,000 cycles, ± 2 db. Moreover, it provides effective crosstalk damping over the most directional frequencies of the spectrum—way out to 20,000 cycles. Channel separation is practically complete: better than 25 db at 1000 cycles, 20 db at 10,000, and an astonishing 12 db at 20,000 cycles.

The 322 tracks at from 1.5 to 3 grams with most arms (1 gram with some). Price with .52 mil diamond stylus and universal mounting bracket is $49.50. Also hear the new, compatible mono/stereo Elac 222, $39.50 with .7 mil diamond.

At your hi-fi dealer now. For complete details, write to BENJAMIN ELECTRONIC SOUND CORP. 80 Swaim Street, Westbury, N.Y./U.S. distributor for Miracord and other Electroacoustic (Elac)® Record Playing Components.

NEW ELAC 322 STEREO CARTRIDGE

www.americanradiohistory.com
Electro-Voice

**BOAZK**
- **B-207A Coaxial Speaker.** The B-207A is a 2-way speaker intended for infinite-baffle enclosures and "large" sound. It is capable of handling modern, high-powered amplifiers.
  - Specifications: 2-way; power handling capacity 20-60 watts; impedance 8 ohms; frequency response 25 to 18,000 cps; sensitivity (in an anechoic chamber) 94 db.

**ELECTRO-VOICE**
- **E4TDX Triaxial Three-Way Reproducer.** A complete three-way loudspeaker system offering the installation ease and convenience of a preassembled kit. Consists of a 3/4" dome tweeter with cerium magnet, and horn, plus an 8" woofers with flexible horn. The system is designed to be installed in most any location with the least possible disturbance.
  - Specifications: 3-way; power handling capacity 30 watts; impedance 8 ohms; frequency response 80 to 16,000 cps; sensitivity 92 db.

**JBL**
- **LE-718C Composite Transducer.** Consists of two completely independent concentrically-mounted JBL precision transducers. The large 8" woofers provide high-frequency response 80 to 20,000 cps; sensitivity 90 db; frequency response 80 to 20,000 cps.
  - Specifications: 2-way; power handling capacity 60 watts; impedance 8 ohms; sensitivity 90 db; frequency response 80 to 20,000 cps.

**GOODMANS**
- **Trutanium Model 906C, 12" Loudspeaker.** The "Trutanium" series of loudspeakers incorporate a "Trutanium" suspension system designed to provide a more natural sound. The 12" woofer is a high-quality unit designed to handle high power levels.
  - Specifications: Triaxial; power handling capacity 20 watts; impedance 8 ohms; frequency response 25 to 18,000 cps; sensitivity 94 db.

**KNIGHT**
- **KN-613C Three-Way Speaker.** High efficiency 12" woofer, 1" dome tweeter, and compression tweeter for highs.
  - Specifications: 3-way; power handling capacity 60 watts; impedance 8 ohms; sensitivity 94 db; frequency response 80 to 18,000 cps.

**LAFAYETTE**
- **SK-58 12-inch 3-Way Speaker.** The SK-58 is a 3-way speaker with a 12" woofer, 1" dome tweeter, and a crossover network.
  - Specifications: 3-way; power handling capacity 50 watts; impedance 8 ohms; frequency response 80 to 16,000 cps; sensitivity 90 db.

**NESHAMINY**
- **Model 310 Woofer.** The model 310 can achieve fine bass response in a totally closed cabinet of small size. This long-throw dynamic woofer perfectly complements the mid/high range complement. The 15" woofer is equipped with a heavy-duty voice coil to provide maximum power handling capacity.
  - Specifications: 15" diameter; power handling capacity 100 watts; impedance 8 ohms; frequency response 40 to 500 cps; sensitivity 92 db.

**PIONEER**
- **P-AT-5X, 15-inch 3-Way Loudspeaker.** The Pioneer PAT-30X is a 3-way speaker designed to provide maximum clarity and definition in the mid-frequency range.
  - Specifications: 3-way; power handling capacity 60 watts; impedance 8 ohms; sensitivity 93 db; frequency response 80 to 18,000 cps.

**ROYAL**
- **"Royal" Speaker Line.** The Permutax "Royal" Speaker line includes 8" and 12" speakers in deluxe and standard versions. The speaker case in this series is a flat, octagonal speaker, which is able to provide a wide frequency range and high output at low cost.
  - Specifications: 12"; power handling capacity 20 watts; impedance 8 ohms; frequency response 80 to 20,000 cps; sensitivity 90 db; dimensions 20 x 20 x 10 inches; weight 10 lbs.

**R & A**
- **700 Series MK IV Dulex.** The latest models of this loudspeaker line are designed to provide maximum clarity and definition in the mid-frequency range.
  - Specifications: 3-way; power handling capacity 100 watts; impedance 8 ohms; frequency response 80 to 20,000 cps; sensitivity 90 db; dimensions 20 x 20 x 10 inches; weight 10 lbs.
SONOTONE

- WAR-DEA 8" Cone. Provides smooth response over entire frequency range. Uses high-frequency cone selector to extend range to 20,000 cps. Highly efficient.Terminals color coded to simplify correct phasing in multiple speaker systems. Power handling capacity 20 watts; impedance 8 ohms; frequency response 45 to 20,000 cps. Price $12.95. Sonotone Corp.
  1. A-12A 2" coax w. built-in crossover ... $3.00
  2. W-12 12" woofer ... $19.00
  3. T-64 6 x 4 elliptical-cone tweeter ... $12.00

STENTORIAN

  1. 8" model H#1225 ... $1.80
  2. 12" model H#1241 ... $1.30
  3. Duplex 12" (concentric) ... $26.00
  4. Duplex 14" (concentric) ... $29.00
  5. Tweeter 2255 ... $15.00

TANNOY

- 15" Monitor Dual-Concentric Loudspeaker. This is the smallest and most compact of the "Monitor Dual-Concentric" line of Tannoy speakers. There is, in addition, a 12" and 15" model. The principle incorporates a horn-loaded high-frequency tweeter, closely integrated with the enveloping LF diaphragm and voice-coil assembly. The units come complete with their individual crossover network system.

Specifications: dual concentric; power handling capacity 20 watts; Impedance 16 ohms; frequency response, + 3 db from 25 to 20,000 cps; magnet assembly 3 1/8" long; L6; Voice-coil diameter 2 1/4" (1H, 2") free air resonance frequency 2000; suggested enclosure volume 12 cu. ft, minimum. Dimensions 1 3/4" dia., 3 1/2" deep; mounting dimensions, (4) 1 1/16 holes on 5 1/8 circle; cutout diameter 4 3/4"; weight, 9 lbs. Price $125.00. Other features: crossover weight 4 lbs.; finish, hard enamel. Tannoy of America.
  1. 15" Monitor for Dual Concentric ... $170.00
  2. 12" Monitor for Dual Concentric ... $138.00

UTAH

- 8-in. Uni Drive Speaker, Model D-14A. An 8-in. speaker with good performance at a moderate price.

Specifications: Dual-cone type, 18-w power handling capacity, 8-ohm impedance; frequency response, 60 to 10,000 cps; 10-oz. magnet. Dimensions: 8 3/32" dia., 4 7/32" deep; mounting dimensions, (4) 1" holes on 7 11/16 circle; cutout diameter, 7 3/16"; weight, 4 lbs. Price $14.05. Utah Electronics.
  1. DBJ, 8" 8-oz. magnet, 1" v.c. ... $10.50
  2. D212, 12" 8-oz. magnet, 1 1/2" v.c. ... $12.50
  3. D12A, 12" 10-oz. magnet, 1 1/4" v.c. ... $16.25
  4. D12P, 1 " 1 5/8-oz. magnet, 1 1/2" v.c. ... $24.00

Harman-Kardon Shatters Old Concepts of Economy-Class Public Address Amplifiers!

New performance and versatility standards with the "CA" SERIES COMMANDER

Unprecedented! 5 New Commanders... every one with CERTIFIED POWER RATING! Now you can plan a job accurately, get the results you expect!

Versatile! Inputs for High and Low Impedance Mics—with on-chassis socket for plug-in mic matching transformer! Every quality or cable length requirement is now satisfied!

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(Continued on page 78)
HERITAGE OF THE BAROQUE

Purcell: Come ye Sons of Art (1694): The Bell Anthem; My Beloved Spoke (early 1680s). Alfred Deller, Mark Deller, soloists of the Deller Consort, Oriana Concert Choir and Orchestra.

Vanguard BSG 5974 stereo

Magnificent Purcell! The great Birthday Ode for Queen Mary, ("Come ye Sons of Art") one of Purcell's greatest works and cast on a Bach-like scale of richness and profundity, gets its second Deller recording here. A superlative duet for pair of counter- tenors, "Sound the Trumpet" is sung this time by Alfred Deller and his son Mark. The son's voice is remarkably like the father's, though fresher, younger and more precise; the two sing a superlative duet. And surely, the tones of this duet will be sounding forth wherever singing amateurs get together the world over. It's catchy.

The other two works are earlier anthems, of quite a different style, less varied in scope, much closer to Monteverdi than to Bach, altogether of a more remote time though ever so clearly from the same unique British mind. The "Bell Anthem" is well known for our chorus—here is the whole of it: "My Beloved Spoke" is a companion anthem of the same period.

Bach Cantatas. (1) Nos. 80, 87; (2) No. 76; (3) Nos. 6, 65; Soloists, Heinrich Schütz Chorale, Pforzheimer Chamber Orch., Fritz Wentzel singing since 1257, 1251, 1261 stereo

Here are three separate LPs in a splendid series of Bach cantata recordings, for my ear the most satisfactory of any to date. They all are in the same performers, including the famous Helmut Krebs as tenor—scaling astoundingly high with remarkably few flaws in pitch—a peneumous but friendly basso, excellent and paternal, named Franz Klein, plus an obedient soprano, Ingeborg Reisch and a rich contralto, Hertha Töpper. The chorus is of top quality, clear, accurate, expressive and in tune, and the orchestra and solo instruments are equally fine.

Two things seem to me outstanding here. First, these performances are musical—they avoid the too-frequent hard, pounding rhythms that mar so many Bach performances, both in Germany and elsewhere. Phrasing and feeling throughout is plastic, intelligently shaped, the diction is excellent and the dramatic impact beautifully calculated.

Second, the recording itself emphasizes the spacious yet highly colored sounds that were Bach's special interest, even to a relatively close-up miking of the featured obbligato instruments along with their matched vocal solo partners—the nasal oboe d'amore, for instance. This, of course, highlights the fact that a recording of our time, while we may get a thick, monotonous "modernized" symphonic orchestration of the recent past have been retired in favor of Bach's original instrumentations, so perfectly calculated for their coloring coupled with space.

The Cantatas here seem to have been chosen both for unusual brilliancy and for their striking contrasts of approach. "Eine Fest Burg" (No. 80), for instance, based on the familiar "A Mighty Fortress is Our God" throughout, in the biggest of big-Bach works, complete with immense choruses and a splendid Bach trumpet; "Die Himmel Erzählen" (No. 76) is a refreshingly early double work of brilliantly contrasted soloist dios, each half taking up an LP side.

Note that the cantata numbering system is not chronological; the works, revised the soonest, now have low numbers, whereas earlier anthems with their colorful and varied dramas have been given higher numbers. Quite arbitrary.


This record continues the gracious music-making that Yehudi Menuhin has been providing in a series of English releases on Angel. The performances offer unique qualities; their somewhat old fashioned elegance of phrasing and tempo is matched by a scrupulously modern regard for "authentic" instrumentations and ornament—a rare and persuasive combination. Angel's suave stereo sound brings out the richness of color and presence in this music without being unpleasantly "hi fi.

Menuhin here teams with the dean of British obestns, Leon Goossens, for a Bach double concerto, oboe, and violin, reconstructed as the original of the Bach Concerto for Two Harpsichords (the original version is lost); Goossens plays the Four Handel Oboe Concerti and Menuhin teams with three Montreal Concerti and Menuhin teams for Four Violins, original of another Bach harpsichord work, the Concerto for Four Harpsichords.


Angel 36298 stereo

This album teams Menuhin with another British musical tender, the virtuoso harpsichordist George Malcolm. According to a suggestion attributed to Bach, himself, the bass line is reinforced by a viola da gamba—though there are works for obligato harpsichord (the keyboard part written out and the right hand playing a melodic line in duet with the violin) and there is no continuo. Mr. Malcolm's lively playing balances Menuhin's somewhat older fashioned violin sound plus the solid bass added by the gamba for a somewhat heavy-handed but moving series of performances—these artists already have the impressiveness of elder statesmen of the art.


Decca DXA 168(2) mono

—And here we have a new, New York styled rendering of the same works, done in the manner of a newer generation. The music flies along, faster and much more lightly than in the Menuhin-Malcolm versions. The harpsichord, on its own without added viola da gamba bass, moves quickly and clearly through the music; the violin, beautifully than Menuhin's, speeds along with only a rare off-note in spite of the brightness. Good indeed.

Most noticeable, though, is the new and modern playing attitude—dead-man accurate in sound, leaving the expression, so to speak, to the notes themselves. Generally, the results are excellent, for these are old masters and musicians. And yet in the presence of this anonymous sort of playing, one somehow misses the old performer individuality that shines through the more old fashioned playing of Menuhin and Malcolm—though perhaps it is to the detriment of well-oiled perfection. I would not want to argue flatly for either approach; but here, in any case, it is a fundamental difference that says much about our time. There is something so remotely away from the past—even the merely middle-aged past.

Decca has put its foot in its mouth. The elaborate notes on each sonata by Mr. Fuller are lacking their headings—each paragrapb begins "this sonata" without further identification. You can figure out which one be means if you work at it.


Vox STPL 500.930 stereo

What a superb artist was old Handel! Next to other works in these now-familiar forms, how strong and sinewy, how nice, Handelian Baroque sonatas! Greatly played from various musical backgrounds—Geneva, Paris, Hartford, Conn.—strike an interesting balance between American and European performance. They are all a vigorous group, excellent in rhythmical drive and phrasing. The Trio Sonata in G Minor on the second side, for oboe, flute and harpsichord, is enough to make you dance all over the floor. It comes through with such superb vigor. The American quality of bounce and vigor is offset by a European carelessness of style that is too often sadly lacking in our Baroque groups elsewhere. Many of our recordings have been Baroque overnight, to satisfy the new market.

Note that the fluent Mario Duances (trained in Switzerland) is of the new generation who also play the recorders—a thing un-thinkable for most standard symphonio-soloists. His recorder isn't as fluent as his flute, but he has an honest grasp and appreciation of the instrument's powers.


Vox STPL 514.000 stereo

"Bach-Händel-style" music from France, the French Baroque, is a new discovery and there is much to be brought forward in all forms. This Telemann Society disc explores five French composers only two of whom are even moderately known—Leclair and Loellet—and the
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feature work of the recording is not by either, a gay little solo cantata on the subject of coffee's edifying effects by one Wheeler. It is an excellent piece and most intelligently sung by Janet Wheeler; the theme is familiar, a series of brief recitative followed by lieder, in the manner of the small Italian operas such as "La Sera Padrona," the accompanied only a harpsichord and violin but the richness of the musical fabric sounding like a recitative. Let me now consider in a new section of this work this has intrinsically more worth than the similar "Coffee Cantata" of Bach and shows recording by singers looking for new material.

The other works here are instrumental sonatas, for cello, flute, recorder, violin, with harpsichord. The material works of the playing is too, though still somewhat marred by the roughness and didactic mannerisms that have characterized the Society under the Schultze. (Why, for instance, the hiccup-like break before each final cadence, imposed on all the Telemann Society performances? And why the monotonously pounding harpsichord accompaniments, solid chords unvaried and mechanical?)


Music Guild S-38 stereo

Loeillet was the eclectic professional of his day in France: his music is popular, and it is necessarily international in style, more French than the music of his contemporary. All in all, it tends to be not too predictably, as in most of these sonatas and trio sonatas—two for the pair of solos and one for each of them alone, plus one keyboard "Lesson." (Suit) for harpsichord solo, Nice French playing, if a bit unf intersected; Pouleau plays it slow but very much recorder as the apparent leader of the two. The stereo recording is done close in a good studio, but is well balanced and clear.

MASSES

Pope John XXIII. (Excerpts from "Sounds of the Vatican.") Mercury RS 600 stereo

Though the disc is not regularly for sale, some broadcasts will encounter it and the longer complete Vatican-State Authorized version from Martin Hiley Producing Degree of Honor Award, St. Paul 1, Minn., for $1.50 mono or stereo.

Material to the late Pope, these excerpts are not too effective for the general listener, yet the great support of the Catholic Church. Of recent Popes, John was the first to appeal widely to the world at large outside of his own flock. The sounds have (could be) too, to speak, academic, intramural, professional, delivering not so much the Pope's larger views as known to all but, rather, some of the technical aspects of his daily life as leader of the immense Catholic religious organization. Mostly, we hear with the Pope's voice reading or reciting Latin in various portions of services, auditudes, appearances on the famous balcony over the Vatican, accompanied by mass responses according to formula. The immense echoes of St. Peter's and the vastness of the structure are still too much for transmittal intelligibility for the listener who does not know Latin. All in all, one of the clear, friendly voice of the Pope himself (so much less familiar than his benign and pleasing persona) these proceedings are more likely to intimidate than to inspire those non-Catholic who may listen to. After all these years, the Pope was the Head of a very specialized and complex operation whose inner workings are mostly beyond the understanding of those on the outside.

The disc is rarely understood. Nevertheless, it shows an all-too-familiar lack of imagination associated with the large, very serious and thoughtfully prepared this material. A few exuberant casual comments, a few more side-comments on unfamiliar "local customs," could have immensely increased the intended air of sobriety and grandeur, reinforcing the sincere appeal of the Pope's own personality.

Sublime loud bursts of handclapping apply in the midst of prayers, for instance, are surely the accepted thing in Rome but may cause unintentional offense to those used to other attitudes. The persistent loud blowing of auto horns by "drive-in" listeners to the Pope's outdoor appearances may be rude too, though part of local reverence. These minor differences in our worldwide customs are wholesome, but need always to be placed in context if they are to take a proper "back seat" in favor of grander concepts.

I must admit, however, that the musical aspects of these topical proceedings are pretty sad. The Pope himself, we are glad to discover, had a pleasant air and a good sense of pitch and style. But the choir in St. Peter's basilica—the choir of choirs, after all—produces the rattiest singing you've ever heard, like tired Italian opera, at one point in a few moments saying so flat of the pitch that the organ comes in dissolutely out of tune. And this at the culmination of a new Saint: Gregorian chant is sung enthusiastically but by the church's own standards—in very poor style, again full of errors. None of it is accompanied by loud organ harmony. Enough to embarrass any music-minded listener and not a happy precedent for the get-together. Remember that in the past the Church laid the foundation for Western music. For centuries the Vatican music itself was the inspiration for the best in religious music-making everywhere.

Missa Luba (Congolese Catholic Mass; Native Songs of the Congo. Les Troubadours du Roi Baudouin, Hazen, Philips PCC 606 (reprocessed for stereo)

The big item on this already-sensational new release is the "Missa Luba," a setting of the familiar words of the Catholic Mass—Kyrie, Gloria, Credo, Sanctus, Agnus Dei—in contemporary Congolese idiom, complete with pounding drums and repetitive chanting.

It was put together by an enterprising group of Congolese troubadours under the leadership of a Father Gabri Haazen, who went to the Congo a good many years before the current political troubles arose. This music is thus reasonably comparable, in its native idiom, to the American spiritual and the asssorted gospel music of our South, modifications of the Protestant Christian service as this is known in the Congo. The magic name of the Congo has already given the disc a broad dose of interest in the mainstream society, with bands playing some of the songs and people, in the good feeling atmosphere of an unusual musical instrument, and the singing and playing young people do a highly sincere and very "pro" job with humble enthusiasm. Beyond that, though, the stuff is not as earth-shaking as might seem the case from the accompanying commentary.

Both the Mass and the very similar native-sung songs on the first record side are, to be sure, "pure Congolese." In the sense of being purely the music of the Congo in its present-day state, that hardly means, as the notes so optimistically say, that it is devoid of any trace of Western influence. Instead, like much of the African music we hear today, this is a clear mixture, the native traditions overlaid with a certain sly, natively western touch of Westernization, a kind of "missions' feeling, easily heard in the simple harmonies that now and then blend into the drums and the leader-chords chanteuse repetitions.

The notes also claim, paradoxically, that the music is and primitive. It will you that, indeed, that primitive music can be highly complex and evolved, even in the sense of the type—again, mainly on intricate, melodic and rhythm lines endlessly repeated and elaborated, the principle of variety within monotony. Yet, the "primitiveness" is also primitive—though Beethoven is not.

Don't let me stop you. Go right out and buy the Luba Mass. You'll enjoy it.
JAZZ and all that

Charles A. Robertson

Stereo

Prince Lasha: The Cry

Contemporary Stereo 57610

While avant-gardists constantly scan the jazz horizon in hopes of being the first to discover a successor to Ornette Coleman, the rest of the world might prefer at least one hard knocking exposition of his theories before anything more puzzling comes along. Prince Lasha, who plays flute, piano and guitar and whose debut was born six months earlier than Coleman in Fort Worth, Texas, where they grew up together and worked in the same local bands during a period of eight or nine years. They both left home about a decade ago, but set out in opposite directions and never happened to meet professionally again. Instead, Lasha formed an alliance in Oakland, California, with South Simmons, an alto saxist with propensities similar to those of his horned companion. After two years of preparation, they went on a tour of the states as Lasha and the Ensemble, and were heard on a recent radio broadcast by the Musical Association of London. Prince Lasha now has a chance to record for the first time.

Always a writer of informative liner notes, Mr. Kooning nearly does his new finds an injustice in his introduction to this album. Like his music, it is a necessity to precede their music, which might be construed in some quarters as meaningful only for the second or third time.

The eight adventures are port serious compositions, and in a sense spectacular, with little historical reminiscence for jazz. All Stan Kenton needs to do is get his band on something like this and not even the men at Cape Canaveral can equal his concentration and intensity of purpose. The orchestra with controlled fury, he carries it along with luscious piano passages dedicated to moon goddesses and proclaiming untold delights. If the Russians had known that Kenton was planning to join the space race, they might never have started the whole business. Richards seems to base his rhythm patterns on a combination of 60's and 70's movie score, perhaps thinking to put a box on rival voyagers with the magic formulas concealed on Arthurs, March To Palace, and Scopion From Another Ray Starling, Gale Baltazar, Den Meza and Mariy Stramso soar through excellent solos, apparently taking inspiration from newspaper stories about astronauts instead of anything in jazz. Carson Taylor's trumpet is truly celestial, with angelic melodies moving gracefully through stereo orbits. The orchestra's space program if the State Department sent the orchestra overseas. Clouds of melodious phonions would be ordered for every brass band in the country.

CISCO HOUSTON: Songs Of Woody Guthrie VANGUARD VTC 1656 (4-track UST) "Pernell Roberts: Come All Ye Fair And Tender Ladies"

If the deluge of new jazzes and youthful comedy groups threatens to drown some established, folk, name, veteran performers only stand that much further above the crowd. Word of Cisco Houston in a program of eighteen Woody Guthrie songs should be more than enough to bring all the faithful rallying around. Quite a few former Dust Busters are feeling the effects of an all-out society by now, owning tape recorders and buying four-track stereo tapes, so they can play in complete sonic comfort when once again the time comes to Blow Down That Old Dusty Road. A unique tribute to the opinion of someone who once saw a part of Kansas suspended in the sky overlooking the desert rays means authenticity and the potential excellence as a constant reminder of tape's dustproof qualities. The realistic performances, at least, in such that even audio-philophiles in air-conditioned rooms may automatically start to reach for the direct sound of a stereo system. Groove cleaning Cisco Houston's guitar receives the brev'ry support of Eric Weissberg on banjo and Rubenstein.

Pernell Roberts would never be mentioned in this company, except that the handsome and unflappable of a real-life American folk bluesman "Blonza" makes a debut full of good intentions and a great deal of good music. The quality of traveling and exchanging songs with Houston away from Hollywood might turn him into a folk singer. Instead, he will be lucky to take a quick trip to Nashville, just to record next time that Atkins in different surroundings. A gift for understatement goes along with a modest demeanor, which compels him to beloved only television viewers will buy his first attempts, and the change is refreshing after so many youngsters who simply sing loud.

Bossa Nova Roundup

Oscar Castro-Neves: Big Band Bossa Nova Audio Fidelity Stereo AFSD5983

Big-band attempts at bossa nova in this country always seem to involve modern ideas of swing, and the esprit of the genuine Castro-Neves and company hawk back to the swing era when playing straight ahead. His experience has apparently taught the Brazilian pianist and composer to reserve advanced techniques for small groups and to use them in arrangements for small groups and big bands. This time he works at pleasing the paying customers with music and arrangements tempos in a way that suits four of his tunes among other native compositions. The sound is made for the swing tradition, with a trombonist billed only as Norato performing some remarkable solo. Extra stereo effects are provided by a trio of percussionists augmenting the regular rhythm section.

Caterina Valente and Stanley Black: I Wish You Love London Stereo P5275

If nobody knows exactly where or when bossa nova first sprang to life, apparently the spirit has been around for ages. The assurance of this certain is that no female vocalist has turned out a bossa nova album approaching such unique beauty as the new one by Lais Bonfa or Joao Gilberto. Evidently the artist must play an instrument as well, or possess the talented Caterina Valente displays with Stanley Black's orchestra in this program of love songs from various countries. In among items from France, England, Scandinavia, Italy and Spain are three numbers with a Latin beat. Without trying, Miss Valente seems closer than others to her sex to the true feeling and spirit of bossa nova. The tenor sax of Eddy View, with Claude Laville, and April In Portugal. London should put her to work on the real thing before the current rush subsides. Meanwhile, enjoy an exceptional singer and a splendid group of songs.

Bud Shank & Clare Fischer: Bossa Nova Jazz Samba World Pacific C1020 (4-track UST)

After wrapping up three bossa nova albums partnered by Laurindo Almeida to start the new Brazilian rhythm on the way, Bud Shank was ready for anything. The wizened young pianist and composer, to continue an intimate survey of the idiom. Except for "Barbarian's Mate," the music is written by Fischer with the idea of showing off two traditional types of bossa nova: one of the delicate Willie Samba, and concluding with the boldly rhythmic Samba Guapo. With a currently acquired immediacy on alto sax,
AR-3 REPORT FROM LONDON: R. L. West writes in the March, 1963 Hi-Fi News, "This is the first time in his life that the reviewer has ever heard 20 c/s from a commercial loudspeaker. Feeling is perhaps a better word. Above 25 c/s it [the AR-3] will take enough power to make really impressive organ pedal tone without obvious harmonic generation.

...the most outstanding feature is its lack of bass—on all the occasions when there shouldn't be any! The reviewer sees why they have been raved about in their homeland."

MUSIC EDITOR'S EVALUATION OF THE AR-3: Robert C. Marsh writes in a recent issue of the Chicago Sun-Times, "If you want maximum music from compact speakers and will pay the price in power, the AR-3 is the obvious answer." (The AR-3's acoustic suspension design requires a small enclosure, without which it could not produce its clean bass.)

DIZZY GILLESPIE ON THE AR-2a: In the January, 1963 Jazz, Charles Graham reports, "Dizzy chose Acoustic Research AR-2a loudspeakers...on the evidence of the bass fiddle beat of his own recordings. In addition he said it was important to him to get extremely clean middle- and high-frequency sounds."

AR-3 speakers are $203 to $225, depending on finish. The AR-2a, a lower-cost version of the same acoustic suspension design, is $109 to $128. The 5-year AR speaker guarantee covers parts, labor, and reimbursement of any freight charges to the factory.

A catalog and list of AR dealers in your area will be sent on request.

ACOUSTIC RESEARCH, INC., 24 Thorndike St., Cambridge 41, Mass.
Times Square is well known to you, me to imitable and merely proves the correlation, tossing of personality, which is no different from the release of the complete record LP, no other examples of Lomb bell in quite the same carefree mood are being pressed at present. A copy belongs in any representative folk or blues collection. Eight titles were issued in the days of the 10-inch LP, and the new additions include two rare and irreplaceable samples of his honky-tonk piano style. Among the classics reclaimed are Ella Speed, Rock Island Line, and Goodnight, Irene.

AUDIO ETC
(from page 10)

Tomorrow," she said, "but I want to sell it today."

She probably didn't. Nor did she stop tossing chewing gum wrappers on the pavement, I suspect, knowing my lady novelist. Which merely proves that audio isn't all-powerful, even two-way in a trash can.

3. Old Lady of Forty Second Street

This summer marks a year's time since I first tried out one of Muhattin's widely-publicized transit innovations, the famous Automated Subway Train, that runs without a motorman. I tried it again last week and maybe it was the heat, or the train's imitable mode of operation, that prompted me to name it. Hit me like a revelation. Of course! The Old Lady of Forty-Second Street. (She runs back and forth, in case you didn't know, directly underneath that well known thoroughfare as part of the Times Square-to-Grand Central shuttle service.) An Old Lady, Indeed. Just try her one of these days.

The relevance to audio in this account is less obscure than you might think. Feedback. This automated train is no more mechanical monster that starts up and stops again like an automaton, always the same. Put from it! The thing has to think, to plan ahead, to calculate its moves and adjust its actions to suit circumstances, always changing. I.e., it has to act like a human motorman. It needs a human-style feedback system.

It must, your see, not only start up (that's easy) and accelerate to full speed, then must slow down carefully, enter the station and stop properly there. All this, of course, while transporting not only its own impressive mass but the ever-varying weight of hundreds of precious people, who must be preserved, so to speak, like human canneli goods.

It can't stop too fast, in case of overshooting. Might shake up the cargo. It can't, alternatively, just go on a bit further, because there's a huge bumper at the end of the track, to squash the cargo most unpleasantly. A very delicate operation, this one. After all, the train runs mostly in the rush hour and its passengers are no better than human sardines, supported upright mainly by their own two feet and the yielding flesh of their immediate neighbors. Gotta be careful. Very careful.

Now if you've traveled in an ordinary, non-animated subway, you'll understand how marvelous is the human feedback system as applied to such heavy-mass engineering. With utter touchlessness, most subway motormen roar into a station at nearly full speed, all that vast mass of humanity and steel and aluminum hurtling forward with an inertia that is dangerous to think about. But the trained human feedback-sense is incredibly accurate; most trains slow smoothly to a measured stop without so much as a noticeable correction in the deceleration curve, hauling up neatly within a foot of the indicator sign ("10" means a ten-car train must stop here.) Good auto drivers do the same on a small scale at every traffic light.

The curves are works of art on such stops, and the means to that art is no other than the immensely quick and subtle feedback mechanism of the human machine, applied to the controls. These are, indeed, advance calculations, rather than actual corrections—the man senses his speed, the distance, the weight, the braking power, and coordinates the whole into a pattern that is as neat as a ballistic curve—and almost as precisely pre-ordained.

Well, the Old Lady of Forty-Second Street has a motorman on board, but he's a mere co-pilot, for emergencies. He stands in the middle ear of the train, looking bored. The Lady herself is in complete control, aided by the most ingenious of transit computers that the Transit Authority has been able to concoct over a long and exciting spell of development and testing. The train is its own boss, and must stop itself.

The first time I rode in the Automated Lady I nearly burst out laughing. You've
never felt such an old lady's personality.

She started off with a blinding rush, then instantly thought better of the idea and
snatched off her power halfway through the acceleration. After a timid coast of a
moment, she tried again, but got scared very quickly. From then on, the trip was
a series of lurches, until with a burst of caution the train stopped almost dead—
outside the station. Then we proceeded to pack, with a series of hysterical little jerks,
power, brakes on, power, brakes off, and the train almost tipped me off
my feet. Right on a dime. But what a lamentable performance! At least it was
very, very safe.

Months later I tried again. Well, I must say, things had improved. This time, after
so long, the Old Lady had more confidence in her feedback reflexes. She started right
in and swept up to full speed without a
pause—only then switching off the power
with a popping of her circuit breakers. We
kept going this time at a good speed,
though with more ungainly corrections than a
beginner automaton on his first trip out.
Still—we stopped once more just short of
the platform. Like a little girl (or an old
lady) holding her nose at the end of a
diving board. Then once more we edged
nervously forward into the station, making
the same series of tentative stops and
renewed starts, all of a flutter, until with a
guilty sigh of relief the Old Lady locked
her brakes for the ten-thousandth time,
no wonder than before. Some automation!
The last time I tried her, after some-
thing like a year's operation, she had been
retired from active duty except in the rush
hours. Too much strain on her automated
nerves, I guess. After all this time, I
thought, she should have found out how to
make a graceful and dignified entrance
into her stations. But no. She still had no
sense of distance; she hadn't any idea, even
now, when to cut her power and coast,
when she should begin applying a smooth,
steady braking power to land her evenly
and precisely at the platform, without
a jerk in a curved, No vision. No intuition.
No subtlety at all in her driving sense.
She might as well have been blind; she
couldn't see beyond the short length of her
own ears (half that of a main line express
train). She wasn't using her automated
hand one little bit. What an Old Lady!
I had to laugh.
I'd sure hate to see likes of her try to
sail into Times Square with a magnetic
ten-car express under her automated con-
trol. She'd probably take minutes to make
up her mind where to stop, tramp up train
after train behind her. And then, who
knows, in an excess of caution she might
back up a few feet, just to be really cor-
dрект. Like an old lady at a traffic light.
Well, boys, get back to your feedback
loops and your audio signals, flat. They're
the best examples on earth in any non-
human, non-living System, of accurate
self-correction, automatic. But don't ever
try to run a subway train with your micro-
outputs. That's a man's job.

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Pianists, Move Over

What makes an instrument “popular”? Is it the repertoire, the artist, or a combination of both?

The king of the recital stage is, of course, the pianist; after him comes the violinist. Next follows the demi-monde of instrumentalists: violinists, cellists, harpists, oboists, clarinetists, and so forth, all of whom are faced with a relatively narrow range of repertoire. The artist who strikes his career on an “unpopular” instrument would appear to be flirting with danger. But he is not as impractical as he seems.

While it is true that most concert managers prefer to groom a new pianist than a new cellist (given comparable talents), the dedicated artist has the right to regard this as a timid approach, meaningless of past and present musical achievements. Living refutation of traditional managerial attitudes are the cases of Pablo Casals, William Primrose, Leon Goossens, and Adolf Scherbaum, to mention a few.

Hungarian-born Janos Starker is one of the most popular players of “unpopular” instruments. Like the artists mentioned, he has overcome a traditional resistance to his instrument with the sheer force of his musical ability. Part of the reason for his success must be chalked up to the manny recordings he has made during the past dozen years.

It can safely be said that Starker is the most frequently recorded cellist of our LP age. Here is a word-picture of Starker at work in the recording studio, promoting the cause of the cello, and of cello music.

After the last notes of the Bach Allegro had faded, he rose from his chair, gently laid aside his Lord Aylesworth Stradivarius, inserted a fresh cigarette into a long holder, and walked swiftly towards the control room. He entered just as the engineer was rewinding the tape and, above the garbled high-frequency sounds, asked, “What was the timing of this movement?” Three minutes and fifty seconds,” I replied. Lifting his black eyebrows, he told us that he played it slightly faster nowadays. “It sounds lighter this way... and it dances.” Having cued the tape, the engineer pressed the start button, and,

from the three monitor loudspeakers mounted on the wall above the studio’s double window, music filled the room.

During the playback, Starker mentally ticked off the details that required adjustment: a stronger reverb for the top note of a phrase, a “wolf” tone needing replacement, a 32nd-note figure that could be clearer, and an A-string note that was a bit sharp. In rapid-fire Hungarian, Starker discussed ensemble and balance problems with his colleague, pianist Gyorgy Sebok, then turned to us for a final consultation before going out into the hall for the second “take.”

The atmosphere at a Starker session is one of efficiency—sotto voce. Starker is no stranger to the recording process. In the early Fifties he made a series of recordings in which he not only played the cello, but also supervised the sessions and edited the tapes. He performed all these tasks not because he aspired to become a musical Orson Welles, but simply because the small company for whom he recorded lacked the necessary skilled personnel. This experience on both sides of the “glass panel” left Starker with a high degree of sophistication about what he calls the “new art of recording.” He knows intimately the technical jargon of the recording director, is quick to point out the slightest deviation in the microphone placement from one session to the next, and works hand in glove with the engineer and producer in achieving maximum presence and faithful representation of the timbre of his superb instrument.

Probably this is why Starker has developed an immunity to a disease common to even the most seasoned artist—nike fright. There is something about the mute electronic device suspended a few feet above the instrument in a lonely recording hall that casts a chilling spell over the majority of musicians. It is a spell that can be broken only after several takes, at which time the microphones and the lack of audience are somehow forgotten in the excitement of the performance. Not so with Starker. A realist, he accepts the microphone and usually is able to produce his basic takes after only a single run-through.

This absence of “temperament” in the
ordinary sense might be regarded as the sign of an easy-going personality. Between takes, Starker responds with charm and quick wit to people around him, is a vivacious raconteur, and loves nothing better than to engage in a brisk and lively exchange of ideas on politics or contemporary literature. But he is no dilettante. Sprunging from the roots of his nature is a significant trait: the enjoyment of mastery.

Born in Budapest into a musical family, Starker began to study the cello soon after he was six. With his two violin-playing brothers, he explored the basic works in the chamber music repertoire. At ten he made his first solo public appearance, and, four years later, he obtained his first orchestral post. Upon graduating from the Franz Liszt Academy (where Gyorgy Schek was a fellow student), he became principal cellist of the Budapest Opera and Philharmonic Orchestras. Between concerts, he practiced, built up his large repertoire, and, for income—amusement—played in jazz bands and gypsy ensembles. He still remembers the potted-plant pieces he used to play in Hungarian cafes, and will occasionally delight his friends by performing some of them, using a wide vibrato and soulful slides.

At the war's end, Starker left home and a secure livelihood to travel west. He settled in Paris where, faced with a scarcity of jobs, he once worked as a movie extra. In an international competition in Geneva, Starker made little more than a respectable showing. At this point, he took a long, hard look at his artistic and technical achievements and decided to completely revise his technique—a risky procedure for a cellist with fifteen years of training behind him. During the winter of 1946, he isolated himself in Cannes to work and study. Music lovers throughout the world are familiar with the results of those crucial months in Starker's career.

Starker employs the utmost economy of technical means: a narrow-range vibrato; a tightly controlled but marvelously relaxed bow; and a straightforward handling of the melodic line, free of excessive slides, those shortcuts to "expression" favored by so many string players. In different hands, such an approach might lead to performances of a cool and introspective nature. But Starker strips down to technical essentials only to intensify his playing.

By 1948 Starker had begun to make his mark on the European concert scene when his friend, Antal Dorati, offered him the port of first cellist with the Dallas Symphony. Starker accepted. After Dallas came first chair posts with the Metropolitan Opera House orchestra and the Chicago Symphony. In 1958 Starker became a full-time soloist and champion of his instrument.

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frequency rate. We need a supply impedance of a fraction of an ohm even at the lowest audio frequencies. A good battery can be used, but if we wish to run from the line supply we must provide a well-regulated power supply unit and this, I think, will need to contain a transistor amplifier system like, though not as large as, the one I described in Audio some time ago. This gets rid of supply lead impedance, because the feedback voltage can be taken back from the terminals of the amplifier itself. This supply problem is not easy, for the comparator will probably be sensitive to supply voltage; so may the oscillator. If audio gets on the supply line you may find you have that long-lost effect, motorboating.

There is a second problem here, too. If the filter begins with an inductance we shall get a very high voltage induced across it when we try to reverse the current. In Johnson's circuit, the half-bridge, diodes are used to catch this. We cannot make the first element of the filter a capacitance without careful thought, because the current at the switch-on moment would not be limited in any way.

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![Fig. 13. Regenerative output stage.](image)

My own feeling is that there is a lot to be said for providing speed-up capacitors giving positive feedback during the transition and at the same time using up some of the stored energy in the inductor. Birt kills two birds with one stone. He suggests that we use an RC circuit across the filter input to turn the load into a constant-resistance network. All the carrier and sideband energy will be dissipated in this resistance, and the current taken by the amplifier will be constant.

![Fig. 14. Differentiated waveform needed to switch regenerative output stage.](image)

The best will all be in the resistor, of course, but I do not like this idea of throwing away efficiency just for convenience, and a big hot resistor is really rather a nuisance. There is no point, by the way, in wondering if you can use a full bridge to balance out the audio term. If the over-all system is 100 per cent efficient you must be taking power in as fast as, and no faster then, you use it.

![Fig. 15. Differentiator-sorter.](image)
My present feeling is towards the use of small rechargeable cells floated across a power supply with normal regulation. I am not at all happy about the problem of providing negative feedback round this sort of amplifier. Mr. Birt suggests that we should be able to provide motional feedback by using a more complicated waveform in which the loudspeaker is left free, by keeping the output stage transistors both off, for a short inter-pulse period, during which the back e.m.f., the motional voltage, is examined with a gating pulse. I do not think we have space here to discuss this. It seems rather complex.

There is quite another problem to be considered. When we put feedback round an amplifier we need to examine the amplitude and phase response well outside the working band. We have no low-frequency problem, for the kind of circuit we are dissussing will operate down to zero frequency. The high-frequency end is very difficult to examine because once we get to one-half the sampling frequency I just cannot see an easy way of interpreting the amplitude and phase shift. This difficulty is there is, in reality, the appearance of the lower sideband of the first carrier frequency. We cannot easily take the feedback at a point after the low-pass filter, because of the phase shift, and also because this could give us a reduction in filtering action, which we can hardly afford. It may be that we only need feedback in our sampling the generator, which is why we use the elaborated Miller circuits.

The use of a pulse system opens the door to the application of other semiconductor devices for audio amplification. Silicon controlled rectifiers, npn switches, double-base diodes, avalanche transistors and I don't know what else may all be considered. Since we can get a factor ten or a factor of vocal audio power output we have got the right to seize the equipment we need to do this. However, there is the story of a British Foreign Secretary whose neighbor enquired why he was making such a noise. He was told "Mr. Bevin is speaking to Washington, Sir." "Couldn't he use the telephone?"

FM-TUNER
(from page 22)

It is impossible to enumerate all the characteristics mentioned above.

Normally, the monophonic FM broadcasting method used is spoken of as a wide-band FM system because the maximum deviation (75 kc) is large compared to the maximum audio frequency (15 kc) resulting in a modulation index of 5. For stereophonic FM broadcasting, higher frequencies (23 to 53 kc) have to be transmitted with a total transmitt-

ter deviation not exceeding 75 kc. For example, when a low-frequency audio signal modulates the 35-ke stereo sub-channel fully, this is equivalent to 75 ke deviation at 35 kc resulting in a modulation index of approximately 2. This is not wideband FM anymore and is very close to narrowband FM. To receive this with low distortion, all significant sidebands have to be handled by the tuner. Referring back to Fig. 3, omission of the fourth and higher pairs of sidebands at m = 2 causes a somewhat larger relative change in phase shift (or distortion) of the resultant than the omission of the seventh and higher pairs of sidebands at m = 5. Therefore, at least three pairs of sidebands have to be handled for the low-frequency stereo components resulting in a bandwidth of 2 x 3 x 38 kc or 228 kc. The high-frequency stereo components require a still larger bandwidth because of a still lower modulation index. This should be compared with a bandwidth of 2 x 6 x 15 kc or 180 kc for good quality monophonic reception. With these bandwidths, distortion in the order of 3 per cent would result for low-frequency stereo signals and approximately 2.5 per cent for a 15-ke monophonic signal (and less than 1 per cent for monophonic frequencies 10 kc and lower).

(ETo Be Concluded)

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KNOWS
(from page 24)

Chin Up

Safe, attractive, easy-to-use knobs can be had, although such knobs will have to be made, not bought. CM regrets that it cannot recommend any commercially available knob, but the project of building one's own is within the capabilities of the average do-it-yourselfer. Those disinclined to home construction of the at least four to possibly dozens of knobs required (CM's Price-Wise combination of a Browning LV-10 tuner plus a Brook 12A amplifier uses eight) will have to seek the services of their neighborhood tool-and-die works.

A Knob CM Can Endorse

What, exactly, is a good knob? To CM's thinking, the best of all possible knobs would be, like Caesar's Gaul, divided into three parts. First, the part of the knob that bears the marker—either a dot or an arrow—should be thin and coin-like. This is so that the marker lies as close as possible to the panel lettering. (Again, see Fig. 2.) Second, the part that will be held for the actual job of turning ought to be soft and rounded for safety, and, if possible, pleasing to the touch. The third is unimportant. (It was only mentioned so we could make the classical reference.)

So far, so good. But where, CM wondered, to find a suitably-shaped object that could be adapted to service as a truly adequate high-fidelity knob?

Research Pays Off

Once again, CM's staff marched anonymously onward to a solution. "Pacifiers!" a researcher cried out. "Pacifiers!" The word cut the air like a sword.

Stunned at first—fearing that one of our staff was making a partisan political judgement—we chided him. But CM erred and is happy to admit it. Our chide was unjustified, and we herewith retract it.

Our researcher meant "pacifiers," not "appeasers." Realizing this, we were as thrilled as our grandfathers had been by Newton's "Eureka!" We had found the answer.

Pacifiers, as CM's subscribers know, are infant (or "baby") pacifiers. These pacifiers are rubber or soft vinyl nipples fastened, for safety, to coin-like plastic discs; these discs, in turn, are fixed to a loop. (The loop is used to pinch the device from between—to quote Ophelia—"baby's "toothless gums.")

1 Another CM division has determined, after considerable research, that it wasn't really Archimedes, after all.

2 Again CM research goes against common knowledge—it wasn't Lady Macbeth.

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**Putting the Pacifier in Service**

With the plucking loop gone, the pacifier can then be drilled out to accommodate the control shaft. CM recommends that it be drilled to fit loosely on its shaft, and then glued firmly and permanently in place with an epoxy-resin cement.

With this done, the only problem still remaining is the addition of the marker dot or arrow. CM regrets that it cannot make a definitive choice among markers; it must be content to suggest—trustingly, albeit featurally, in the judgement of its readers. CM will merely point out that excellent, eminently usable arrows may be found in the meter mechanisms (the glass-faced portions) of most test instruments—VTVM’s and VOM’s, for example. If high cost is desired. VU meters—or any other simple meters—may be cannibalized with good, though by no means excellent, results.

Truly economy-minded consumers who choose the simpler, and frequently satisfactory, dot-type markers may affix any small brilliant-cut semi-precious stones they fancy. The unhardened cement left over from the initial fastening may be used to effect still another economy.

**Fifty Words About Buying**

Pacifiers like those recommended by CM are generally available, like records, from the local pharmacy. They usually come twelve to a handy, reusable cardboard display panel. Buying an entire cardful, CM feels, should entitle the buyer to a considerable discount from the advertised unit price (plus a singular show of respect from the sales-clerk).

**RATINGS OF PACIFIERS**

**GRADING:** Good ratings suggest only CM’s conviction that the particular manufacturer has not, as yet, been caught. Bad ratings prove that he has.

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NUMMY #301 (Guncraft, Inc.; Suckling, Vt.) 92¢ Excellent over-all adaptability. Vinyl nipple, nylon disc. Disc smooth and flat with just a trace of rounding at the rim; nipple soft and well-contoured. Pink and blue only. Best of all pacifiers tested.

**A Price-Wise**

NUMMY #301 (Guncraft) 89¢ Excellent adaptability, but some discs were marred somewhat by “flash”—a more or less pronounced seam caused, at times, by less than perfect matching of dies in the casting process and elsewhere. Check before buying. Available in pink, blue, and Decorator Ambivalent. Otherwise identical with NUMMY #301.

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**FAIR TO MIDDING**

Rooby “Joy BJ-100E” (E. Shafmaul, GmbH; Wetlar, Germany) 49¢ Good adaptability. Polished brass disc, soft rubber nipple with truly amazing resiliency. Would have been rated higher except for excessively verbose instructions (574 pages) dealing with child-rearing, duty, honor, and the vicissitudes of history.

**A Caution**

CM feels bound to mention a shortcoming inherent in its recommended knobs. They are inordinately attractive to young animals and small children. Any piece of equipment using CM-type knobs should be mounted out of the reach of the unweaned, human and otherwise.

**And a Warning**

Beginning with its October issue, CM will cost 75¢ the copy. A steady increase in our production costs makes a rise from CM’s traditional 15¢ inevitable. The yearly subscription rate will increase from $4.00 to $12.00 (fair-trade). No discounts are available.

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**A NEW CONCEPT IN TAPE RECORDER DESIGN**

**THE UHER 8000 ROYAL STEREO**

Never before have so many outstanding features been combined in one ultra-high-performance tape recorder. The Uher Royal Stereo 8000 is the finest and most versatile recorder to be offered in this country. It is capable of truly professional quality 4-track stereo and monaural recording and playback. Two separate recording heads, with built-in mixer controls for both channels, monitor before or after recording head.

Completely transistorized, problems of heat, weight and electrical stability have been eliminated. Other features include echo effect, built-in automatic slide projector control, 3 microphone inputs, sound-on-sound and sound-with-sound, and much more. Weighs only 23 pounds.

- 7½%, 3⅞%, 1⅞%, and 1516 ips. tape speeds; - 50 to 20,000 cps. at 7½ ips. ± 3 db. - 50 db. channel separation - Wow and flutter ± 0.15% @ 7½ ips.

See your franchised Uher dealer or

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**WRITE FOR DETAILED LITERATURE**

**MARTEL ELECTRONIC SALES, INC.**

Exclusive U. S. Importer

645 N. Marotel Ave., Hollywood 46, Calif. - Offices in New York and Chicago

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AUDIO • AUGUST, 1963 77
PRODUCT PREVIEW SECTION

\[\text{(from page 63)}\]

**Specifications:** bass-reflex/born enclosure; 8" extended-range speaker; power handling capacity 10 watts; impedance 8 ohms; frequency response 25 to 20,000 cps; sensitivity (watts input for 85-db level 10 feet on axis) 14 watts; magnet weight, 6.8 oz.; voice-coil-diameter 1"; other features: 3" whisper cone 65-eps resonant free; (free air) annular cone, dual diameter Alnico 5 magnet; 10-milimeter; 23" wide, 11" high, 9.5" deep; weight, 26 lbs.; finished available and prices: unstained $195.00; Oiled Walnut $320.00. Cabrioli.

**DUKANE**

- **Ionovac Speaker System.** Utilizing ionized air instead of the conventional speaker diaphragm for converting electrical pulsations into sound, the "Ionovac" high-frequency speakers are available either separately or as part of a complete speaker system as the Duke-20 full-range system. The "Ionovac" section has a frequency range from 3500 to 20,000 cps. The Duke-20 includes two mid-range speakers and a 12" high-compliance woofer in addition to the "Ionovac." Price: $165.00. Dukane Corp.
  1. Duke-10 tweeter ........................................... $79.50
  2. Duke-30 wide-range system .......................... $199.50
  3. Duke-40 wide-range system .......................... $149.50
  4. Duke-50 bookshelf system ...................... $139.50

**EICO**

- **HFS-6 1-way-3 Speaker System.** The new EICO HFS-6 can be set into a bookshelf, mounted on a wall, placed on a table, or concealed behind curtains or draperies. It is the preread system in pairs for stereo, especially where space is restricted.

**Specifications:** dleted-port enclosure; speakers-10" LF, 8" MF, dome tweeter h.f.; power handling capacity 20 watts rms; 1.5" crossover network; Impedance 8 ohms; frequency response 50 to 20,000 cps; magnet weights LF: 14 oz.; MF: 12 oz.; dimensions: 23½" wide, 13½" high, 5½" deep; weight, 25 lbs. K7, $225.00, wired $405.00. EICO.
  1. HFS-10 1-way speaker system .................. $29.95
  2. HFS-11 2-way speaker system ........... $47.95

**ELECTRO-VOICE**

- **EV Four. Three-Way High-Compliance System.** Three-way system with 12-inch ceramic magnet woofer, compression driver and diffraction horn combination for mid-range, and 5-inch dynamic cone tweeter. Three-way rarely circuit board crossover at 800 and 3000 cps. Two step-type level controls for setting room balance. Mid-range unit is new driver-horn combination utilizing a ring-type diaphragm. Tweeter makes use of special polyurethane foam suspension, damping and compliance. Completely sealed enclosure.

**Specifications:** acoustically sealed enclosure; speakers-12" LF, horn-loaded compression driver mid.f., 5.25" MF, 1" dome tweeter high.f.; power handling capacity 30 watts; three-way hybrid circuit board crossover network; Impedance 8 ohms; frequency response 30 to 20,000 cps; sensitivity (watts input for 85-db level 10 feet on axis) 4 watts; magnet weights: LF 1 lb. 6 oz.; MF 1 lb. 13 oz.; h.f. 0.8 oz.; voice coil diameter 1½; other features: complete instructions for installation printed on back panel, finished on all four sides. Dimensions: 25¼" wide, 14½" high, 13½" deep; weight, 44 lbs. Electro-Voice.
  1. EV Six, 4-way high-compliance system .......... $300.00
  2. EV Two, 2-way high-compliance bookshelf system ............. $96.00
  3. Regina 200, 2-way dute-load high compliance bookshelf system .......... $89.50
  4. Marquis 300, 3-way direct radiators ............... $199.00
  5. Coronet I, 8" pre-finished loudspeaker system kit ................ $39.00

**EMI**

- **DLB129-Bookshelf Speaker System.** Woofer has patented elliptical aluminum-woofer cone and polyvinyl chloride cone suspension, resulting in a smooth mid-frequency response and greatly reduced transient distortion. Tweeters have curved diaphragms.

**Specifications:** Infinite baffle envelope; speakers-15" x 8" LF, and m.f.; (2) 3½" h.f., power handling capacity 20 watts rms; 1.5" crossover network; Impedance 4 ohms; frequency response 60 to 10,000 cps; finished available and prices: walnut $250.00, oiled walnut $314.00. EMI Electronics.
  1. Model 711, 3-way bookshelf ..................... $249.00
  2. Model 319, 2-way bookshelf ................. $96.75
  3. Model 630, 2-way bookshelf .................. $97.95
  4. Baffle No. 1, 2-way ......................... $115.00

**GRADO**

- **Lab Jr. Speaker System.** Utilizes a speaker-cone loading scheme which tends to improve frequency response. Dimensions: 16" wide, 16½" high, 15" deep; weight, 22 lbs.; finished and prices: walnut $93.00. Grado Labs.

**JENSEN**

- **TF-4 Speaker 4-way Slender Loudspeaker System.** This Jensen system combines a speaker 4-way sound with a new full-size horn-loaded format, "body of grille fabric; a custom-woven two-tone pattern, or all-over ratten.

**JBL**

- **Trimline 54. The JBL Trimline 54" couples in an LEPST full-range transducer with a passive low-frequency radiator. Both units are integrated in a matching acoustical enclosure of slim design. The passive radiator effectively doubles the acoustic radiating area at low frequencies, providing improved performance, lower distortion, and increased power handling capacity.

**Specifications:** modified reflex enclosure; speakers-4½" LF, (passive), 1 full range; power handling capacity 25 watts; impedance 8 ohms; voice coil diameter: full range, 2½"; cones equipped with hanging brackets. Brass legs optional. Dimensions: 20" wide, 23½" high, 5½" deep; weight 34 lbs.; Oiled walnut $119.95, Skylight $150 brass legs $120.00. James J. Landau.

**KLH**

- **Model Fourteen.** The Klh Model Fourteen is a newly developed compact loudspeaker system incorporating two small highly compliant full-range direct radiators and a passive electronic network which radiates the power output of any conventional amplifier so that it exactly matches the low-frequency power requirements of the Model Fourteen. Impedance, 8 ohms; power handling capacity, 12 watts. Dimensions: 14½" wide, 18½" high, 13½" deep; weight 14 lbs. Oil or satin walnut. $49.95. KLH.
  1. Model Four, oil walnut .................. $231.00
  2. Model Five, oil walnut .......... $275.00
  3. Model Ten, oil walnut ................. $59.00

**KNIGHT**

- **KE-297 Four-way Four-Speaker System.** Four-way four-speaker system with 10½" woofer, 8" mid range, 3½" closed-back one-way high.f. speaker, and adjustable level control. Tweeter with adjustable level control.

**Specifications:** power handling capacity 50 watts; Impedance 8 ohms; frequency response 30 to 20,000 cps; magnet weights: LF 16 oz.; voice coil diameters: h.f. 1½"; electrical crossovers at 600, 4000 and 10,000 cps. Dimensions: 24½" wide, 15½" high, 6½" deep; weight, 35 lbs.; finished available and prices: Walnut veneer $79.95. Allied Radio.
THE TAPE RECORDER MIRACLE THAT BEGAN IN 1846...

That was the year Jacob Estey made his first organ. His heritage of golden sound production continues to inspire the electronics pioneers who create Estey Organs, Amplifiers, Cinebox and Tape Recorders.

Made in America for American audiophiles, Stereo 70 offers such advanced professional features as:

- **Audio Output Power**: 40 watts peak (20 watt/channel) • Frequency response: 50-15,000 cps at 1% distortion, 50-10,000 cps at 3% distortion • Signal-to-Noise Ratio: Better than 45+ • Wow & Flutter: Less than 0.25% • Bias and Erase Guard • Automatic Shut-Off: Stops when tape runs out or breaks, in all modes of operation. Provides a unique "sleep-switch" and safety guard • Recording Facilities: Sound-on-sound, Sound-with-sound, 4-track monaural, dual-track monaural, 4-track stereo • Stereo-Dub-A Track Switch: Involved in sound-with-sound, sound-on-sound, stereo-Dub-A Track Switch • Counter: Digital display, 3 digits, resettable

An unusual recorder for home entertainment at an unusually low price: $339.95 list. Other models start at $99.95.

FOR THE SOUNDTEST INVESTMENT YOU CAN MAKE... hear the Estey Tape Recorder... a year Estey Tape Recorder dealer... or write for free literature.

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THE TAPE RECORDER MIRACLE THAT BEGAN IN 1846...

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Made in America for American audiophiles, Stereo 70 offers such advanced professional features as:

- **Audio Output Power**: 40 watts peak (20 watt/channel) • Frequency response: 50-15,000 cps at 1% distortion, 50-10,000 cps at 3% distortion • Signal-to-Noise Ratio: Better than 45+ • Wow & Flutter: Less than 0.25% • Bias and Erase Guard • Automatic Shut-Off: Stops when tape runs out or breaks, in all modes of operation. Provides a unique "sleep-switch" and safety guard • Recording Facilities: Sound-on-sound, Sound-with-sound, 4-track monaural, dual-track monaural, 4-track stereo • Stereo-Dub-A Track Switch: Involved in sound-with-sound, sound-on-sound, stereo-Dub-A Track Switch • Counter: Digital display, 3 digits, resettable

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Made in America for American audiophiles, Stereo 70 offers such advanced professional features as:

- **Audio Output Power**: 40 watts peak (20 watt/channel) • Frequency response: 50-15,000 cps at 1% distortion, 50-10,000 cps at 3% distortion • Signal-to-Noise Ratio: Better than 45+ • Wow & Flutter: Less than 0.25% • Bias and Erase Guard • Automatic Shut-Off: Stops when tape runs out or breaks, in all modes of operation. Provides a unique "sleep-switch" and safety guard • Recording Facilities: Sound-on-sound, Sound-with-sound, 4-track monaural, dual-track monaural, 4-track stereo • Stereo-Dub-A Track Switch: Involved in sound-with-sound, sound-on-sound, stereo-Dub-A Track Switch • Counter: Digital display, 3 digits, resettable

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FOR THE SOUNDTEST INVESTMENT YOU CAN MAKE... hear the Estey Tape Recorder... a year Estey Tape Recorder dealer... or write for free literature.
PILOT

- Crystal 5-2-3-way loudspeaker system $79.95

- Reflecta II, infinite baffle enclosure with 16" mid-range and 4" high-frequency speakers, $107.00.

- CS-165, a band-pass system that provides big bass response without being big. It is a 5-way system mounting a 12" woofer, a 4" mid-range unit, and three tweeters including one exponential horn unit and two cone-type units.

- CSX-410, a loudspeaker system. The CSX-410 consists of a 10" low-frequency high-extension woofer and separate wide-dispersion mid-range tweeter units, all combining in a handsome cabinet. The crossover network blends the separate speakers into a single sound source. Testing techniques pioneered by H. H. Scott assure matching from speaker to speaker for exact balance. Specifications: Type of enclosure, bookshelf; speakers-(1) 12" l.f., (1) 6" m.f., (1) 3" h.f.; power handling capacity 50 watts; type of crossover network, aforesaid; impedance 16 ohms. Dimensions: 23 3/8" wide, 11 3/4" deep; weight: 37 lbs.; net price: $195.95; net hardwood, $195.95; walnut or mahogany, $183.86. H. H. Scott, Inc.

SHERWOOD

- Ravenia 3-way loudspeaker system is based on a rigidly constructed enclosure. Fabricated of one-inch solid-core veneered side walls and one-inch rear wall, speaker baffle. A front-to-back reforcement strut eliminates possibility of panel vibration. All speakers are reproducible from the front, and the crossover network is accessible through speaker openings. Specifications: Type of enclosure, tube panel; speakers: (1) 12" l.f., (1) 6" m.f., (1) 3" h.f.; power handling capacity 60 watts (type of crossover network, 12-d/0-c at 400 and 3000 cps); impedance 8 ohms; frequency response 2 1/2 dB from 80 to 10,000 cycles (1) 12" l.f.; (1) 6" m.f.; (1) 3" h.f.; max. 13 1/8", 15" high, 9/8" deep, Walnut $169.95, Pine $159.95.

PIONEER

- CS-A50 loudspeaker system. The 4 way-per-channel speaker system provides big bass response despite its very small cabinet. It is a 5-way system mounting a 12 inch woofer, a 4 inch mid-range unit, and three tweeters including one exponential horn unit and two cone-type units.

- CSX-410, a loudspeaker system. The CSX-410 consists of a 10" low-frequency high-extension woofer and separate wide-dispersion mid-range tweeter units, all combining in a handsome cabinet. The crossover network blends the separate speakers into a single sound source. Testing techniques pioneered by H. H. Scott assure matching from speaker to speaker for exact balance. Specifications: Type of enclosure, bookshelf; speakers-(1) 12" l.f., (1) 6" m.f., (1) 3" h.f.; power handling capacity 50 watts; type of crossover network, aforesaid; impedance 16 ohms. Dimensions: 23 3/8" wide, 11 3/4" deep; weight: 37 lbs.; amplifier input 12 3/8" wide, 5 1/8", 11 1/2" deep; weight: 23.5 lbs. Mitsubishi.

WHARFEDALE

- W4.04 Acoustic Full-Range 2-speaker system and Sand-filled Enclosure. The original Acoustic unit. Though bulky. It is an integrated full-range speaker system in all respects. Specifications: Sand-filled ported dust cover; speakers -12" l.f., 5 m.f., and h.f.; power handling capacity 60 peak watts; L.C. 15,000 cycles crossover network; impedance, 8 ohms; magnet weights: (1) 152 oz. (5 lbs.); input impedance, 20 ohms. Magnet weights: (1) 152 oz. (5 lbs.); input impedance, 20 ohms. Magnet weights: (1) 152 oz. (5 lbs.).

H. H. SCOTT

- 8-3 3-way Loudspeaker System. Only 5 3/4" deep. It is of true bookshelf size. The 8-3 consists of a 10" low-frequency high-extension woofer, and separate wide-dispersion mid-range tweeter units, all combining within a handsome cabinet. The crossover network blends the separate speakers into a single sound source. Testing techniques pioneered by H. H. Scott assure matching from speaker to speaker for exact balance. Specifications: Type of enclosure, bookshelf; speakers-(1) 12" l.f., (1) 6" m.f., (1) 3" h.f.; power handling capacity 50 watts; type of crossover network, aforesaid; impedance 16 ohms. Dimensions: 23 3/8" wide, 11 3/4" high, 9/8" deep; weight: 37 lbs.; net price: $195.95; net hardwood, $195.95; walnut or mahogany, $183.86. H. H. Scott, Inc.

UTAH

- R-8" Thin Bookshelf "Sorcerer." A handsome, compact, good-sounding speaker system. Specifications: Bass reflex type with 8" l.f. and 3" m.f. speakers; power handling capacity, 12 watts; crossover frequency; impedance 4 ohms; frequency response -2 db from 20 to 20,000 cycles. Dimensions: 2 3/8" high, 17 1/2" deep. D. Price: $294.60; Alpine-Lansing, $214.40; Arrow, $202.50; Pioneer, $310.40; Syl-O.50.
Eight ReasotrS WHY YOU SHOULD INSTALL UNIVERSITY COMPONENT SPEAKERS

To get right into them...there are the Brandenburg Concertos, the Prague Symphony, Eroica, Petrouchka, La Bohème, the Benny Goodman '38 concert, Jazz at the Philharmonic, Ella singing Gershwin, West Side Story, the soundtrack from Breakfast at Tiffany's, T. S. Eliot reading Prufrock, Waiting for Godot, Lester Linn's music for dancing— but why not complete the list yourself according to your own tastes and needs? You may even come up with more than 2,000 reasons why University component speakers are the finest you can buy today. They are recognized as the prestige speakers in the popular price range. Anything on record or tape shows you why!

THE 312 INTEGRATED TRIAXIAL SYSTEM

—a high compliance 12" woofer, patented Diffusions mid-range and Sphericon super tweeter, all in one. Frequency response: 28-40,000 cps. $73.00 net.

SPECIALIZED INDIVIDUAL 3-WAY SYSTEM

—consisting of the C-12HC 12" high compliance woofer, C-88 mid-range and Sphericon super tweeter. Frequency response: 20-40,000 cps. $91.40 net.

Write for free catalog, Desk R-B

UNIVERSITY LOUDSPEAKERS
Division of Ling-Temco-Vought, Oklahoma City, Oklahoma
TANNNOY

**GIF Speaker System.** The "GIF" system provides a compound expanding sound source-a Tannoy exclusive feature! the effect of this is that the wave front area varies with frequency, giving an outstanding illusion of realism to both solo and orchestral music. The system incorporates the Tannoy 15" Monitor Dual Concentric loudspeaker.

**Specifications:**
- B.C. 15" Monitor w/15" Dual Concentric Monitor
- B.C. 12" Monitor w/12" Dual Concentric Monitor
- B.C. 9" Monitor w/9" Dual Concentric Monitor
- C.C. 9" Monitor w/9" Concentric Monitor
- C.C. 7" Monitor w/7" Concentric Monitor

**Features:**
- Classic Mark II: Simplicity of line and styling permits perfect integration with other fine furniture of any period. Three-way system composed of heavy-duty high-compression inch woofer, specially designed 8-1/4" mid-range, and 1-1/4" tweeter. Perfectly matched to 150 and 5000 cps. Wide-range brilliance and clearness of tonal quality without having to walk behind the unit.

**Specifications:**
- Ducted port enclosure; speakers: 1-1/2" f.f.; 1-4" m.f.; 1-3/4" h.f.; power handling capacity 90 watts; electrical crossover networks; impedance 4-ohms; frequency response 40 to 20,000 cps; tweeter diameter: 1-1/2" m.f.; 1-3/4" h.f.; 1-5/8" f.f. Dimensions: 9-5/8" H x 10-3/4" W x 5" deep. Oiled walnut $285.00. University Loudspeakers.

**Amplifiers:**
- Model 604: 4-1/2 track; records 4-track stereo, 4-track mono, plays 4 track stereo, 4 track mono; record size 7 in.; 2 motors; output 5 watts; input 2.5 mV; signal-to-noise ratio 70 db; wow & flutter, 0.2% at 75 cps, 0.5% at 33,000 cps; 1200 ft. reel; 90 secs.; output power 5 watts. Dimensions: 15" wide, 14" high, 14" deep. Weight: 50 lbs. AMPLIFIER CORP.

**Universe:**
- Model 1249: A portable 4-track stereo and mono recorder/player in attractive grey luggage—w/two record electronics and playback preamplifiers. The 1260 is ideal for semi-professional recording and long-life service in education, business, theater, church, or audio systems.

**Specifications:**
- Speeds: 31/2, 7 1/2, 15 ips; heads: 1/4" track; records 4-track stereo, 4-track mono, plays 4 track stereo, 4 track mono; record size 7 in.; 2 motors; output 5 watts; input 2.5 mV; signal-to-noise ratio 70 db; wow & flutter, 0.2% at 75 cps, 0.5% at 33,000 cps; 1200 ft. reel; 90 secs.; output power 5 watts. Dimensions: 15" wide, 14" high, 14" deep. Weight: 50 lbs. OTHER FEATURES: handles 10" reels; duplicates stereo or mono tapes; record stereo sound-on-sound with DK-1 accessory. Price: $495.00. Bell Sound.

**Benjamin Truvox:**
- PD-94 4-Track Stereo Tape Deck. The PD-94 utilizes a capstan drive motor, a 6% balanced flywheel, and two rewind motors to ensure speed accuracy, even rewind, and highly responsive performance. The various models of operation. Some are equipped for colored signal outputs for easy and quick identification. Precision tolerances and heavy-duty components provide trouble-free operation and longevity. The deck is a one piece, ribbed heavy casting.

**American Concerntone:**
- Model 605-8. An advanced machine for the serious recordist. Incorporates flexibility features such as plug-in head assembly, alleelectric pushbutton operation, and automatic reverse.

**Specifications:**
- Speeds: 31/2, 7 1/2, 15 ips; heads: 1/4" track; records 4-track stereo, 4-track mono, plays 4 track stereo, 4 track mono; record size 7 in.; 2 motors; output 5 watts; input 2.5 mV; signal-to-noise ratio 70 db; wow & flutter, 0.2% at 75 cps, 0.5% at 33,000 cps; 1200 ft. reel; 90 secs.; output power 5 watts. Dimensions: 15" wide, 14" high, 14" deep. Weight: 50 lbs. Other features: handles 10" reels; duplicates stereo or mono records; record stereo sound-on-sound with DK-1 accessory. Price: $495.00. Bell Sound.

**Audio August 1963**
**BUTOBA**

- MT-7: Portable transistorized 2-speed 2-track mono deck, product of West Germany. Record-level indicator, operates from four flashlights; batteries, available for other power sources; complete with dynamic microphone and carrying handle; full line of accessories available.

**Specifications**:
- **Speeds**: 7-1/2, 3-3/4, 1-1/2, 1-1/4 ips.
- **Dimensions**: 13” wide, 9” high, 7-1/2” deep.
- **Weight**: 7 lbs.
- **Price**: $349.95

**CONCORD**

- **209 Stereo Recorder**. The Concord recorders feature transistorized preamplifiers, "super triax" pickup systems, sound-on-sound, separate 6" speakers, all push-button interlocked. Controls, cut and soft touch, public address or internal speaker monitoring, 2-1/2" meters, automatic turntable, 2-speed automatic record equalization, 2-track microphone, 3 full-year warranty on parts, 90 days labor.

**Specifications**:
- **Speeds**: 7-1/2, 3-3/4, 1-1/2, 1-1/4 ips.
- **Dimensions**: 17” wide, 9-1/2” high, 7-1/2” deep.
- **Weight**: 7 lbs.
- **Price**: $349.95

**DUAL**

- **T901 Tape Deck**. Four-track stereo/mono record and playback, smooth and positive tape handling, mechanical fully automatic controls. No pressure pads.

**Specifications**:
- **Speeds**: 3-1/2, 1-1/2, 1-1/4, 1-1/8 ips.
- **Dimensions**: 17” wide, 9-1/2” high, 7-1/2” deep.
- **Weight**: 7 lbs.
- **Price**: $349.95

**EICO**

- **406 4-Track Stereo/Mono Deck**. Compact 4-track stereo and mono recorder-player to incorporate a 4-track tape transport with electronic capability, record and playback equalization on both 7-1/2 and 30 ips, tape to tape speeds. Mixing and line-level controls. Noise-reduction tubes Indicators. No pressure pads and precision tape guidance. Top-of-the-line jumbo-speed shift; bidirectional turning counts, automatic end-of-tape switch.

**Specifications**:
- **Speeds**: 7-1/2, 3-3/4, 1-1/2, 1-1/4 ips.
- **Dimensions**: 17” wide, 9-1/2” high, 7-1/2” deep.
- **Weight**: 7 lbs.
- **Price**: $349.95

**FIBERGRAPH**

- **Specifications**:
- **Speeds**: 7-1/2, 3-3/4, 1-1/2, 1-1/4, 1-1/8, 1/2, 1/4, 1/8 ips.
- **Dimensions**: 17” wide, 9-1/2” high, 7-1/2” deep.

**FESTY**

- **Stereo 100 Tape Recorder**. Vertical mount complete 4-track record/play stereo with sound-on-sound, sound-on-sound. Wing speaker, fully recording level meters, digital control.

**Specifications**:
- **Speeds**: 3-1/2, 1-1/2, 1-1/4, 1-1/8 ips.
- **Dimensions**: 17” wide, 9-1/2” high, 7-1/2” deep.
- **Weight**: 7 lbs.
- **Price**: $349.95

**NEEDLE**

- **Sono-Flex® Needle**. The new Sono-Flex® needle incorporated in the Velocite Mark III and other Sonotone cartridges brings new pleasure to music lovers. It not only does it overcome the problem of broken needle shanks, but it increases music listening pleasure by providing higher compliance, wider and flatter frequency response, lower distortion, less needle and record wear.

**NEW SONOTONE Sono-Flex® Needle**

- **Sono-Flex® Needle**
- **Price**: $349.95

**SONOTONE CORPORATION, ELMSFORD, N. Y.**

**AUDIO • AUGUST, 1963**

83
**FREEMAN**

- Professional Studio Model 206. Automatic reverse and/or automatic continuous play in both directions. Automatic shut-off in manual modes; four double-shielded heads; source or tape monitoring while recording; sound-on-sound or sound-with-sound; built-in echo effect; transformerless; hysteretic motor; two output filters; professional touch button controls; four-channel mixer with four input level controls; 0.1% amplifier design for extremely wide frequency response.

**SPECIFICATIONS:**

- Speeds—7½, 3½ ips; heads—2½- and 3½-track stereo. Records 4-microphone, 1-track stereo; plays 4-track stereo, 4-track mono; red size 7 in.; 1 motor; timing accuracy 98% freq. resp.—7½ ips; 2 db from 50 to 10,000 cps; 3½ ips; 2 db from 50 to 10,000 cps; signal-to-noise ratio, 50 db; wow and flutter, 0.12% at 7½ ips, 0.15% at 3½ ips.
- 600-ohm reed. 200-ohm, 5% 32 db.
- 2 microphone, high impedance, sensitivity 1 mv.; 2 high impedance; amplifier outputs: 2, 2 high impedance: speaker outputs 2, impedances 3.2 ohms; output power 0.6 watts. Dimensions: 21 ¼” wide, 8½” high, 14%” deep; weight, 28 lbs. Price, $185.00. Allied Radio.

**KNIGHT**


**SPECIFICATIONS:**

- Speeds—7½, 3½ ips; heads—2½-track stereo; records 4-microphone, 1-track stereo; plays 4-track stereo, 4-track mono; red size 7 in.; 1 motor; timing accuracy 98% freq. resp.—7½ ips; 2 db from 50 to 10,000 cps; 3½ ips, 2 db from 50 to 10,000 cps; signal-to-noise ratio, 45 db; wow and flutter, 0.07% at 7½ ips, 0.05% at 3½ ips; readout time, 1200-ft. red. 90 secs. Input—1 microphone, high impedance, sensitivity 2 mv.; 1 high impedance; amplifier outputs: 1, 1 high impedance: speaker outputs 2, impedances 3.2 ohms; output power 0.6 watts. Dimensions: 21 ¼” wide, 8½” high, 14%” deep; weight, 28 lbs. Other features: built-in microphone, radio, radio, 15 watts. Price, $79.50. Lafayette Radio.

**LAFFAYETTE**

- RK-1541Y 4-track Stereo Recorder. Both speeds automatically equalized. Fades control: sound-on-sound: automatic stop at end of tape; two 4×67 speakers; transistorized stereo preamplifier; two recording-level meters; 5-digit index counter.

- **SPECIFICATIONS:**

  - Speeds—3½, 7½ ips; heads—2¼- and 3½-track stereo. Records 4-microphone, 1-track stereo; plays 4-track stereo, 4-track mono; red size 7 in.; 1 motor; freq. resp.—7½ ips, 2 db from 50 to 18,000 cps; 3½ ips, 2 db from 50 to 18,000 cps; signal-to-noise ratio, 45 db; wow and flutter, 0.07% at 7½ ips, 0.05% at 3½ ips; readout time, 1200-ft. red. under 4 min. Input—2 microphone, impedance 300 ohms; 2 high impedance; amplifier outputs: 2, 2 high impedance: speaker outputs 2, impedances 3.2 ohms; output power 0.6 watts per channel. Dimensions: 15½” wide, 7½” high, 11½” deep; weight, 34 lbs. Other features: includes 2 microphones, output cables, empty reel and 1200-ft. roll of tape. Price, $169.05. Lafayette Radio.

**NAGRA**

- Nagra III Mini Tape Recorder. The Nagra III is a portable self-contained tape recorder suitable for professional or amateur work. Dependability, reliability, and ease of use.

**SPECIFICATIONS:**

- Speeds—15, 7½, 3½ ips; heads: 3 full track; records, 1-track mono; plays, 1-track mono; red size 3 in., ¼ in. with cover open; 1 motor; timing accuracy 0.1% sensitivity 97%. Dimensions: 14” wide, 10” deep, 6” high; weight, 15 lbs. Price, $99.50. Nagra H 1/2-track portable recorder $59.95.

**NORGREN**

- Norgren 1111 Tape Recorder. The Norgren 1111 is a portable self-contained tape recorder suitable for professional or amateur work. Dependability, reliability, and ease of use.

**NEWCOMB**

- Model SM-316-1B Stereo 8-Track Tape Recorder. The 8-track Model SM-316-1B is the earlier model of the Continental 8-track. Control of the tape transport is controllable by means of an external control. The unit can operate either horizontally or vertically and from 3” to 12” reels, as well as to 9” reels.

**SPECIFICATIONS:**

- Speeds—3½, 7½, 15 ips; heads—4-track stereo, 4-track mono; records 4-track stereo, 4-track mono; plays 4 or 2-track stereo or mono; red size 7½ in.; no. of motors 1; timing accuracy 0.5%; freq. resp.: 7½ ips, 2 db from 50 to 18,000 cps; 3½ ips, 2 db from 50 to 18,000 cps; signal-to-noise ratio, 45 db; wow and flutter, 0.07% at 7½ ips, 0.05% at 3½ ips; readout time, 1200-ft. red. under 4 min. Input—2 microphone, impedance 300 ohms; 2 high impedance: speaker outputs 2, impedances 3.2 ohms; output power 0.6 watts per channel. Dimensions: 15½” wide, 7½” high, 11½” deep; weight, 34 lbs. Other features: includes 2 microphones, output cables, empty reel and 1200-ft. roll of tape. Price, $169.05. Lafayette Radio.

**NORTELCO**

- Continental 581 (Model 4L345). Fully transistorized 4-track, 4-speed tape recorder featuring two preamplifiers for stereo playback through any radio, TV, or Hi-Fi system. Features new superlative fourth speed of 14½ ips for up to 32 hours of recording on a standard 7½-reel. Contains facilities for stereo playback and mono record/playback and includes two preamplifiers, power output 2.0 watts, with power output 2 watts per channel. Dimensions: 15½” wide, 7½” high, 11½” deep; weight, 34 lbs. Price, $560.00. NorTelco Products.

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feature permits tracks 1 and 2, or 3 and 4 to be played back simultaneously so that prerecorded stereo tape can be played back monophonically without loss through the built-in speaker. Price $225.00, North American Philips.

1. Model "Continental 100" (Model EL3558) $129.50
2. Model "Continental 300" (Model EL3541) $179.50
3. Model "Continental 600" (Model EL3542) $289.50
4. Model "Continental 401" (Model EL1534) $399.50

PHONO TRIX

- Executive 8x-8. Miniature recorder and sound system complete with deck top amplifier, leather carrying case, telephone adapter. It can be used as a miniature recorder, portable public address system, telephone amplifier and record.

Specifications: Speeds: -75, 33, 16 ips; heads -2 1/2-track, records 2-track mono; input 1 mV, output 1 V, sensitivity 1%, weight 2 lb. Price, $299.50. Matthew Stuart.

ROBERTS


Specifications: Speeds: -75, 33, 16 ips; heads -2 1/2-track, records 2-track stereo, 2-track mono, plays 2-track stereo, 2-track mono; output 1 V; input 1 mV, sensitivity 1%, weight 2 lb. Price, $299.50. Matthew Stuart.

TANDERME

- MODEL 63. Three-speed, four-track, stereo record/playback tape deck with automatic stop. Multifunction filter built in.

Specifications: Speeds: -75, 33, 16 ips; heads -3 1/2-track, records 4-track stereo, 4-track mono, plays 4-track stereo, 4-track mono; output 1 V, input 1 mV, sensitivity 1%, weight 2 lb. Price, $299.50. Matthew Stuart.

3. Model 997 stereo tape recorder . . . $499.50
4. Model 440 stereo tape recorder . . . $469.50
5. Model 192 full-track mono recorder $349.50

SONY

- Model 490 Stereophonic. The Sony Model 490 Stereophonic is a 4-track stereo and monophonc recording and playback deck with sound-on-sound and sound-on-sound (stereo mike and line mixing), "freeze" of "tracks" or "tapes." YU meters, separate record, playback, and monitor amplifiers, synchronous motor, high line level outputs, and vertical or horizontal operation. Comes complete with carrying case and two Sony PS-87 dynamic, cardiod pattern microphones.

Specifications: Speeds: -75, 33, 16 ips; heads -3 1/2-track, records 4-track stereo, 4-track mono, plays 4-track stereo, 4-track mono; output 1 V, input 1 mV, sensitivity 1%, weight 2 lb. Price, $299.95. Matthew Stuart.

- Model 500 Stereophonic . . . $399.50
2. Model 464-L Stereophonic . . . $319.50
3. Model 464-D Stereophonic . . . $399.50
4. Model 263-D stereo tape deck . . . $115.50
5. Model 500-A complete . . . $500.00


Specifications: Speeds: -75, 33, 16 ips; heads -3 1/2-track, records 4-track stereo, 4-track mono, plays 4-track stereo, 4-track mono; output 1 V, input 1 mV, sensitivity 1%, weight 2 lb. Price, $299.50. Matthew Stuart.

-MODEL 63. Three-speed, four-track, stereo record/playback tape deck with automatic stop. Multifunction filter built in.

Specifications: Speeds: -75, 33, 16 ips; heads -3 1/2-track, records 4-track stereo, 4-track mono, plays 4-track stereo, 4-track mono; output 1 V, input 1 mV, sensitivity 1%, weight 2 lb. Price, $299.50. Matthew Stuart.


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Specifications: Speeds: -75, 33, 16 ips; heads -3 1/2-track, records 4-track stereo, 4-track mono, plays 4-track stereo, 4-track mono; output 1 V, input 1 mV, sensitivity 1%, weight 2 lb. Price, $299.50. Matthew Stuart.
This mighty mite records anything... anywhere. Only 2½ pounds light (including batteries), push button operation, transistorized for instant recording, instant playback through microphone, amplifier or headphone. Plus safe rewind, automatic erase. Plays a full 70 minutes on a standard ¾" tape. Use it at home, in classroom or office. Can even be used as a portable P.A. system.

VERNON

1/2"/4" Stereo Tape Recorder. The name of the recorder comes from its complement of 47 transistors and 26 diodes in its all-transistorized circuitry. This instrument is completely self-contained, with dual recording and playback amplifiers and built-in monitoring speakers. Among its features are: three motors; three heads; all-electronic switching; three controls for each channel (time, record level, playback level); automatic rewind, replay, and shut-off; three inputs per channel with simultaneous intermix; sound-on-sound and echo effects; remote control; pause switch for editing; and monitoring from either the recorded tape or the preamplifier inputs.

Specifications: Speeds—7¼, 3⅞ ips; heads—(3½"/4"); recorders 4-track stereo, 4-track mono; plays 4-track stereo, 4-track mono; reel size 7 in., 3 motors; freq. resp.—7¼ ips, ± 3 db from 30 to 20,000 cps; 3⅞ ips ± 3 db from 30 to 18,000 cps; signal-to-noise ratio, 50 db; wow and flutter, 0.3% at 7¼ ips, 0.3% at 3⅞ ips; rewind time, 1200 ft, reel, 50 sec. Inputs—microphone, impedance 2k ohms, sensitivity 150 mv; 2 high level, impedance 50k ohms, sensitivity 5 mv; speaker outputs 2, impedance 4 ohms; output power 2.2 watts. Dimensions, 14" wide, 13" high, 7" deep; weight, 25½ lbs. Other features: transistorized, may be played top down and 7" reels, built-in system to synchronize auto. projector with tape. Accessories: sound activated switch (skid) $17.95. Martel Elect.

VIKING


Specifications: Speeds—3⅞, 7¼ ips; heads—quarter-track; records 4-track stereo, 4-track mono; plays 4-track stereo, 4-track mono; reel size 7 in., 3 motors; freq. resp.—7¼ ips, ± 3 db from 20 to 25,000 cps; 3⅞ ips, ± 3 db from 20 to 15,000 cps; signal-to-noise ratio, 55 db; wow and flutter, 0.2% at 7¼ ips, 0.3% at 3⅞ ips; rewind time, 1200 ft, reel, 90 sec. Inputs—2 microphone, impedance 2 meg, sensitivity 1 mv; 2 high level, impedance 250k ohms, sensitivity 0.1 volts; amplifier outputs—(1) stereophonic impedance 4-600 ohms; (2) v. amp., out. imp. 1K ohms; speaker outputs 2, impedance 4 to 8 ohms; output power 6 watts. Dimensions, 16" wide, 15" high, 9½" deep; weight, 45 lbs. Other features: audio-controlled recording, remote control, bias metering and adj. on front panel, photoelectric shut-off, index counter. Price, $860.00. Viking of Minneapolis.

MICROPHONES

ALTEC

603 Cardioid Dynamic Microphone. The 603A Cardioid Dynamic is a modest-priced version of the 603A. It has the same features as the 603A but eliminates the sintered-bronze filter, thus giving a somewhat more open sound. The 603B is the most versatile microphone for the small broadcast or television station, and for most recording uses.

Specifications: dynamic; cardioid; die, pattern; baked enamel finish; output impedance 50-200, 200k, 5500; freq. resp., 45 to 15,000 cps; length of cable furnished 15 ft., dimensions—1½" dia., 14½" long; weight—11 oz. Slip-on adapter mounting. Price, 87.00. Altec-Lansing.

AMERICAN

D15. For public address, home recording, and theater stage applications.

Specifications: dynamic; cardioid die, pattern; baked enamel finish; output impedance 50-200, 200k, 5500; freq. resp., 45 to 15,000 cps; length of cable furnished 15 ft., dimensions—1½" dia., 14½" long; weight—11 oz. Slip-on adapter mounting. Price, 85.00. American Microphone.

Audio • August, 1963

Matthew Stuart Co., Inc.
156 Fifth Ave., N. Y. C. 10

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www.americanradiohistory.com
**Electro-Voice**

- **Model 476 Dynamic Cardioid**
  - Cardioid dynamic microphone offering continuously variable diaphragm material which permits extremely wide response and wide input impedance. Diaphragm material is specified. High pressure diaphragm eliminates shock and noise. Complete line of professional studio and broadcast microphones also available.

**Specifications**:
- **Dyneon®** diaphragm material
- Die cast chrome finish
- Output impedance 150 ohms
- Frequency response 20 Hz to 20 kHz
- Weight 14 oz.
- Price $32.95

**Neumann**

- **Model U 47 Condenser Microphone**
  - This condenser microphone is especially designed for studio recording applications. Its "drum-style" switch and overload protection make it ideally suitable for multiple applications. The microphone can be used for recording applications.

**Specifications**:
- Die cast chrome finish
- Output impedance 50 ohms
- Frequency response 20 Hz to 20 kHz
- Weight 8 lbs.
- Price $79.95

**Fremman**

- **Model DM-160 Dynamic Microphone**
  - Built-in transformer to match any high-impedance input. Die cast housing, wind screen. Comes complete with two 5 ft. cords to fit standard phone jack or mini jack. Die cast desk stand. In beautiful fitted walnut case.

**Specifications**: dynamic
- Omnidirectional pattern
- Die cast case
- Output impedance 600 ohms
- Frequency response 20 Hz to 20 kHz
- Weight 6 lbs.
- Price $29.95

**Knight**

- KN-4530 Economy dynamic microphone with desk stand. Usable with 90 per cent of Vocal recorders.

**Specifications**:
- Dynamic: omnidirectional pattern
- Die cast case
- Output impedance 600 ohms
- Frequency response 20 Hz to 20 kHz
- Weight 6 lbs.
- Price $29.95

**Lafayette**

- PA-463 Dynamic Stereo Microphone
  - Featuring the new push-button switch with selective pattern at all frequencies. also offers a 5-ft. cord or mini jack.

**Specifications**:
- Dynamic: diaphragm with switch
- Pattern at all frequencies
- Weight 6 lbs.
- Price $17.95

**Dynaco—B&O**

- Model 200 Stereo Microphone
  - Dual ribbon stereo microphone designed for broadcast and recording applications. The top section (which is rotatable through 90° with respect to the lower section) can be removed for monophonic use. The phase characteristics of the 200 make it manually well suited to the requirements of multichannel broadcasting, with independent selectable frequency response. Price, $24.95.

**Specifications**: ribbon: figure 8 (each element) diaphragm pattern; duralumin diaphragm material; die cast chrome finish; output impedance 200 ohms; frequency response 20 Hz to 20 kHz; weight 1 lb.; quick clip adapter to standard thread mounting; other features: talk-through switch, phase switch.

**Electro-Voice**

- Model 50 50-ohm mono $59.95
- Model 57 50/250/42-2 mono $69.95
- Model 100 200-ohm mono $89.95
- Model 100 conversion element to make Model 200 from 100 $69.95

**Audio**

- August, 1963
BASIC

SPECIFICATION

"Monitor" Dual Concentricts:

Models

10", 12", and 15"
Frequency response

30–20,000 cps ± 3 db
Polar Distribution

60° inc. angle – fall at 15,000 cps

Write for full details.

TANNOU (AMERICA) LTD, P.O. BOX 177, EAST NORWICH, N.Y. U.S.A.
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The SIXTH AUDIO ANTHOLOGY includes articles on two most significant milestones in the field of high fidelity: FM STEREO and TRANSISTORS IN AUDIO EQUIPMENT. The FM STEREO articles which appeared in AUDIO – the original magazine about high fidelity – were written by the men who actually worked on the system approved by the FCC. The articles pertaining to TRANSISTORS IN AUDIO APPLICATIONS cover interesting aspects of working with the semiconductor. As in previous editions of the AUDIO ANTHOLOGY, the SIXTH is a compilation of important articles which appeared in AUDIO over a period of about two years. And, all of the articles were written by knowledgeable and experienced authorities in the field. The SIXTH AUDIO ANTHOLOGY is a meaningful reference for everyone in the diverse fields of audio engineering, recording, broadcasting, manufacturing and servicing of components and equipment, and for the audio fans who make this business of high fidelity what it is today.

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AUDI0 • AUGUST, 1963

www.americanradiohistory.com
**Sensitivity** as an essential parameter... what makes a microphone suitable for different applications. Let's delve into some specifics from various manufacturers.

### ROBERTS
- **Model 90-68 Ceramic Microphone.** Ceramic microphones are engineered for use with Roberts recorders. Each microphone includes a radiator and desk stand.

### SCHOEPS
- **Professional Condenser Microphone.** The Schoeps CM-60 V is designed with a patented multiple pattern radiator, made of metal, for enhanced performance. The switchable 1/2" attenuator between the capsule and the preamplifier prevents overload and distortion. It's furnished with a Matte satin chrome finish, not rusting, of 0.095 (150 ohms) sensitivity, -55 db, maximum input level is 20k.

### SHURE
- **Model 57E Omnidirectional Dynamic Microphone.** A new dynamic microphone designed for television and radio broadcasting. It is equipped with a switchable 3-pattern (cardioid, omni, and bi-directional) radiator, providing flexibility for stereo recording.

### SONY
- **C-57R Condenser Microphone.** The Sony C-57R condenser microphone offers an adjustable cardioid pattern, making it ideal for stereo recording. It's furnished with a Chrome finish, of 0.095 (150 ohms) sensitivity, -55 db, maximum input level is 20k. Rejection of extraneous noise is high. Outputs are answered by EMI and FM radio stations. It provides for versatile applications.

### UNIVERSITY
- **Model 902K Cardioid Modular Dynamic Microphone.** A shock-mounted cardioid dynamic microphone for maximum rejection of extraneous noise. Provides flexibility of mounting of all kinds. Sensitivity is 0.055 (150 ohms). Weight is 3 lbs. Power supply and carrying case, and cable, Price, $275.00.

### SONOTONE
- **Ceramic 33-710 (matched pair).** Suitable for stereo, broadcasting, and recording. Includes a radiator and desk stand. Rugged and durable.

The question of making a priceless family heirloom for $2.10? This is a challenge for many tape enthusiasts. The offer from Tarzian Tape sounds intriguing.
HEADDPHONES

DAVID CLARK

- Model 100 Headset. The David Clark Model 100 headset receivers are of the highest quality in design and performance. The drivers in the acoustic chambers are of moving-coil type with plastic diaphragms. Reduction of extraneous sound and noise is achieved by the ear seals—assuring maximum personal listening pleasure.

Specifications: dynamic; freq. resp. 20 to 15,000 cps; impedance 4, 8, 16 ohms; sensitivity 35 db at 1 mw; maximum power handling 1 watt; 3 contact plug; cord 8 ft; net weight 1 lb. Price $24.95. Jensen Mfg. Co.

1. HS-1L HS-1 with 4 spade-lug terminals $22.50
2. CN-1 Space-Perspective® cross-feed network $19.50
3. CC-1 stereo headphone control center $39.75

ELEGIA

Dynamic Stereo Headphones. Light headphones with soft headband to reduce fatigue.

Specifications: dynamic; freq. resp. 25 to 17,000 cps; impedance 8, 16 ohms; power handling ability, 0.5 watt; cord 6 ft; Fujiki Electric Co.

FREEMAN

- Stereo Head Phones, Model SEP-100. The Freeman SEP-100 can be worn under the chin or over the head. Built-in controls over volume and a stereo-mono selector switch.

Specifications: Treq. resp. 3% to 20,000 cps ± 2 db; impedance 8 ohms; plug stereo; cord 6 ft; net weight 12 oz. Price $24.95. Freeman Elect.

JENSEN

- HS-1 Stereo Headphones. Contoured ear cushions for perfect seal. High-compliance, corrugated, moisture-resistant diaphragms. Aluminum voice coils and sintered magnetic circuits with efficient, powerful Anico magnets.

KNOSS

- Dynamic Style Headphones. Light weight headphones which has built-in ear cushions to eliminate ambient noise to an attenuation of -40 db at 1000 cps. Ear cups and head band are removable for cleaning. Charcoal black and blue-gray trim. Price 20 to 20,000 cps. $29.50. Allied Radio.

Specifications: dynamic; freq. resp. 20 to 15,000 cps; impedance 4 ohms; sensitivity 1 volt at 400 cps; will develop 15 lb of sound pressure referred to 0.0002 dynes/cm²; maximum power handling 10 watts; 8 conductor plug; cord 8 ft; net weight 12 oz. Price $24.95. Accessories: 7.5 remote control listening station, Price $8.50. Koss Elect.

1. PRO-4 headset $45.00
2. PRO-500 headset (600 ohms) $55.00
3. SP-3SN dual-mode stereophones $24.95
4. SP-3GM stereo/mono phones $24.95
5. SP-3SV dual input stereophones $24.95

LAFFAYETE

- F-770 Stereo Headphones. Adjustable headband, foam ear cushions, 215° dynamic speakers.

Specifications: dynamic; freq. resp. 25 to 15,000 cps; impedance 8, 16 ohms; maximum power handling 500 mw; plug standard; cord
PERMOLUX

- B-19S-28 Stereo-Fones. All units carefully sealed against moisture and dust intrusion. Headband of nickel-plated flexible spring steel, covered with top-grade leather. Earpieces designed for close fit. Tin fitting to ears. Molded neoprene cushion, with multi-strand aluminum-bronze conductors.

- 8.95. $4.95.


P.M.L.

- B-14-2 Headphones. Dynamic headphones built to meet the highest requirements for mono or stereo applications. Stereo wiring for mono provides 400 ohms whereas parallel gives 100 ohms. Soft rubber earpads.

Specifications: dynamic; freq. resp. 20 to 20,000 cps; impedance 300 ohms; sensitivity 112 db; max. power handling 50 mW at 25% distortion; cord 10 ft.; net weight 17 oz. Price $25.50. Eumora Corp.

MISCELLANEOUS

AMPLIFIER CORP.

- "Magneraser" Models 2200 and 2207. Light, portable bulk tape eraser for all types of sound recording tape. The "Magneraser" serves a dual purpose. Completely erases tape on the reel without rewinding; also demagnetics record-playback and erase heads. Can also be used to demagnetize tools.

Specifications: switch—momentary push-button; field intensity, 750 gauss (max.); line voltage, 117 volts (nominal); power consumption, 60 watts; current, 3.45 amps; power factor, 0.25; size, 22" high, 4" diameter; weight, 54 lbs.; model 2200. Price $15.00. Amplifier Corp.

- "Magnaraser" models 3000, 100 to 240 volts.

- "Magnetizer" models 100, 240 volts.

ARTISAN

- "Empress" Model Organ. Full size A.G.O. console with 2200 pedals and two 8' manuals. All painted-circuit tone generators, Factory assembled manuals, pedal, and console. Plays through mono or stereo systems. Tone similar to pipe organ. Line of 14 models available on a pay-as-you-build basis. Con-

SHARPE

- HA-10 Stereo Headphones. The HA-10 stereo headphones are solidly constructed and have leather-covered earpads.

Specifications: dynamic; freq. resp. 20 to 12,000 cps ± 1 db; impedance 8 ohms; sensitivity 115 db; maximum power handling 2 watts; plug, std. 3-con.; cord 6 ft. Price $39.50. Roberts Elec.

SONOTONE

- "Empress" SHM-100. Rugged headband and boom mike features high intelligibility for language lab and hi-fi applications.

Specifications: crystal; freq. resp. 50 to 10,000 cps; volume control; maximum power 500 ohms; phone plug; cord 5'.; net weight 13 oz. Price $40.75 (w. ceramic boom mike). Sonotone.

IF WE SAID THIS, YOU'D NEVER BELIEVE US*

(unless you already own an ADC speaker system)

MICHELLE MONE

- "Audio Devices," known for the ADC cartridges and the Pritchard tone arm, has introduced a line of high quality loudspeakers that incorporate novel design features such as the use of a rectangular-shape woofer...It is a very smooth, natural-sounding speaker system that strikes us as one of the finest presently available...

The ADC-18 in particular appears to be an outstanding reproducer from any standpoint, one that is suited for the finest of home music systems...

The initial impression of listening to music through the ADC-18 was one of immediate acceptance, and this impression has been strengthened after weeks of listening. The speaker does not favor one type of music, or one family of instruments, over another. It is an impartial, honest, transparent reproducer that seems to render no more or less than what is fed into it...

The ADC-18, in sum, is very easy to listen to and live with, and is a worthy complement to the ADC cartridge itself.

Now you be the judge! Audition the ADC-18 speaker system at your hi-fi dealer.

*excerpts from the Equipment Report section of the April 1963 issue of HIGH FIDELITY magazine. Write for the full report.

SPECIFICATIONS

- Freq. Response . . . .20-20,000 cps

- Power Handling . . . .to 65 watts

- Min. Power Req. . . . .10 watts

- BASS UNIT MAGNETIC STRUCTURE

- Flux Density . . . .12,700 Oersteds

- Total Flux . . . .165,000 Maxwells

- TREBLE UNIT MAGNETIC STRUCTURE

- Flux Density . . . .15,000 Oersteds

- Total Flux . . . .53,500 Maxwells

- Impedance . . . .8 to 16 ohms

- Net Consumer Price . . . .$250

- Electro- Vibe $350.00

- "Empress" SHM-100

- "Electro- Vibe" $350.00

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Magnetic Recording Tape No. 250-36. A new Burgess formulation makes possible a thinner oxide coating to reduce tape thickness, thus allowing 5000 feet of tape to be included on a 1-inch reel. Extra strong In-Pont Mylar, half-mil tensified polyester is used for the backing. Price $11.55. Burgess Battery Company.

CBS LABORATORIES

- STR-100 Stereophonic Frequency Test Record. STR-100 frequency test record tests pickups and systems for sweep and spot-frequency response with voice announcements, channel separation, warble tones, wear, compliance, phasing, vertical and lateral tracking, tone arm resonance. $2.00. Audio Products, CBS Laboratories.

TIMELINE

1. STR 110... $10.00
2. STR 111... $10.00
3. STR 120... $10.00
4. STR 10... $10.00
5. STR 140... $10.00

EMT

- 1 Series Reverberation Units. A precision-manufactured steel plate develops high spectral-energy delay of sound for natural-sounding artificial reverberation. Delay period is variable from 0.5 to 5.0 seconds manually or by optical remote control. Stereo version, EMT 140S. Ideal for FM MIX systems, for studio recording. Steel plate in mounting suspension by center and pickup microphone and associated amplifiers. Occupies 8" x 4" x 6". Weight 374 lbs. Complete unit with stand and stands and loads. Price: $245.00 mono, $260 stereo. Gotham Audio.

1. Remote control conversion kit... $5.70
2. $14.00 mono, remote control... $25.20
3. 196$ stereo, remote control... $34.90

FAIRCHILD

- Model 510 Compressor. Self-powered automatic sensing device that restores original full range dynamics eliminated due to various recording techniques. The Compressor with automatic gain increase provides dynamic expansion of high levels to compensate for controls placed on original recording of disk, tape, or FM transmission. Not an amplifier: does not introduce distortion. May be switched for use as compressor for pleasant background music or overload protection in home tape recording and PA systems. A stereo device, may also be used monophonically.

SPECS:

Kits: 100K ohms to both channels; input impedance; output impedance 37K to 47K ohms; power amplifier output needed 40 to 16 ohms; min. control circuit voltage for Compressor action 0.25V a.c.; expansion 6.0 db per channel; compression 20 db max/ channel; attack time 10 m/sec; distortion none; frequency response 4.1 db thru entire audio range; a.c. power required none. Price $75.00. Fairchild Recording.

1. 210K kit version of the Compressor... $59.95

FERODYNAMICS

- TK7: 7" Tape Kit. Contains: Two 3" reels, two 3/4" reels, two 3/4" reels, 1200 acoustic 1 spindle reel. T-1 centering tape, 2 leader tapes, 1 stereo tape, 6 tape clips, 1 hook. Includes magnetic recording tape, 1 marking pencil. In a functional carrying case. $15.00. Ferody-namics Corp.

- TRK-100 Stereo Frequency Test Record. TRK-100 frequency test record tests pickups and systems for sweep and spot-frequency response with voice announcements, channel separation, warble tones, wear, compliance, phasing, vertical and lateral tracking, tone arm resonance. $8.50. Audio Products, CBS Laboratories.
GENERAL ELECTRIC

- **MA-40 FM-Stereo Adapter.** The General Electric model MA-40 is a self-contained, self-powered unit used to deliver a stereo signal, from any stereo having suitable characteristics, to the input of a stereo amplifying source for reproduction.

**Specifications:** Input signal level: 1-2 volts rms sine wave corresponding to 75 kc deviation (12.8 peak-to-peak volts maximum) (2.8 peak-to-peak volts minimum); gain unity +3 db. Input impedance: 2 megohms and 50 pf; output impedance 12,000 ohms; separation 20 db at 1 kc. Input and output: 60 db. Frequency Response 50 to 15,000 cps +3 db, referred to standard de-emphasis curve; dimensions—mounting base 10" long, 2 1/2" wide, with mounting holes spaced 2 1/2". Clearance of 3" is required for rotation and adequate ventilation for heat dissipation must be provided. Price: $112.95. General Electric Co.

FM/Ω

- **Dynaphone Wideband FM Vagi Antenna.** Features all stainless steel fasteners and hardware, positive marine retention brackets to ensure low-loss, electro-mechanical circuit symmetry. All aluminum is bursheled, seamless drawn extrusion, extra heavy wall thickness throughout. Stainless steel "U" bolt for attachment to mast. High F/B ratio for optimum rejection of adjacent and co-channel interference. Antenna may be stacked to form a two-way array for an additional 35% signal gain. Eight elements dual driven with yagi yielding +6 db distortion from 200 ohm impedance standard. Dimensions: 40" long, 3" diameter. Price $37.05.

**Specifications:**
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- **Output Impedance:** 50 ohms.
- **Gain at 1 kc:** -4 db.

**Price:** $49.95.

- **FM/Ω Super Mark II, 12-element broadband yagi:** $39.95.
- **FM/Ω Super Mark III, 21/2-element stacked yagi:** $149.95.

- **FM/Ω "Metropolitan," economy 5-element yagi:** $14.95.

FREEMAN

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*Some of the E-V microphone firsts include: The Differential, Mechanochoke, Variable-D, Cardioid and Sound Spokes, plus a new dynamic and booster microphone designs, Acoustalloy® and Acoustiflex®, plus the E-V Model 676 has earned the first Academy Award microphone citation in 22 years, for its contribution to modern picture sound.